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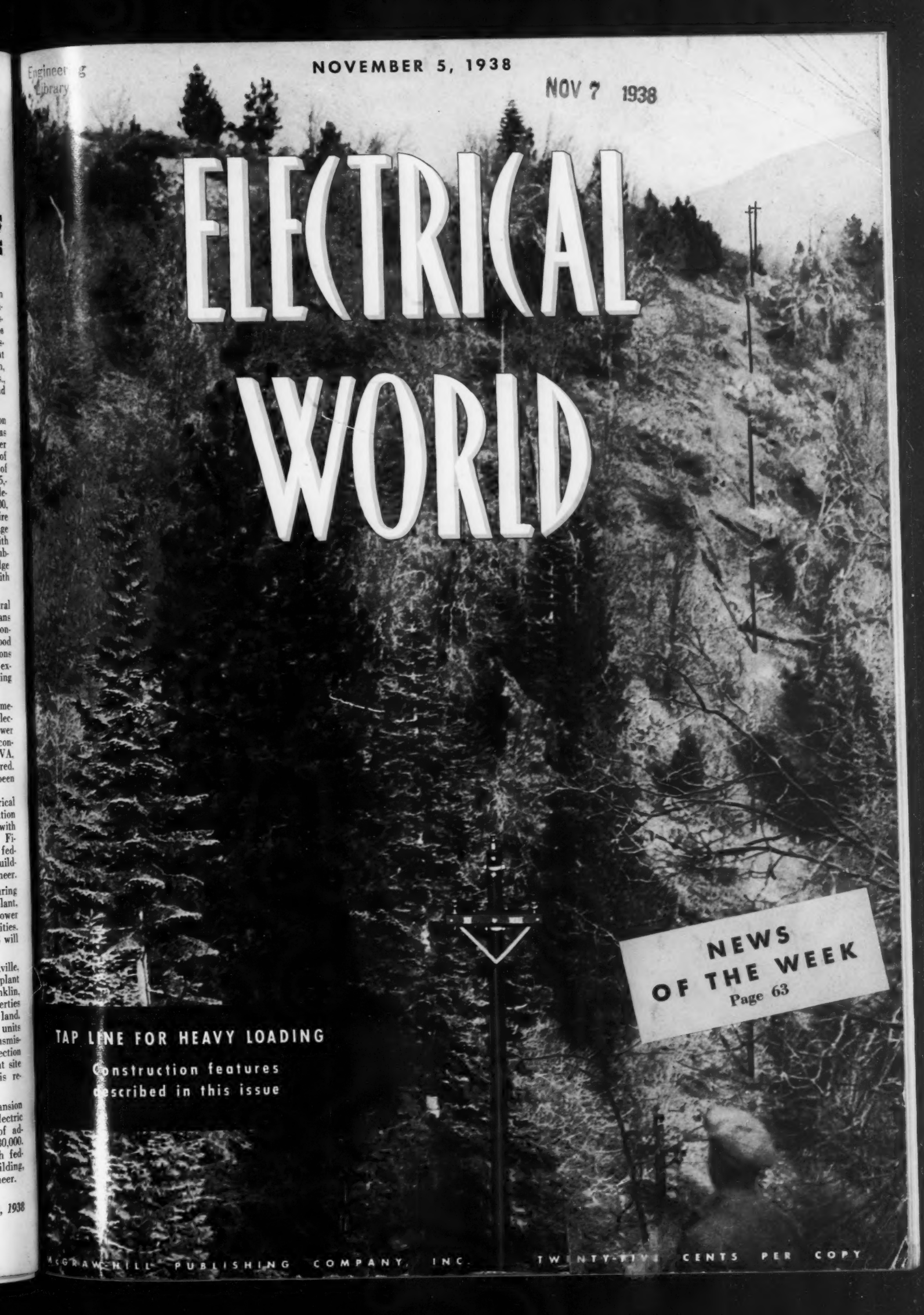

NEWS OF THE WEEK
Page 63

TAP LINE FOR HEAVY LOADING

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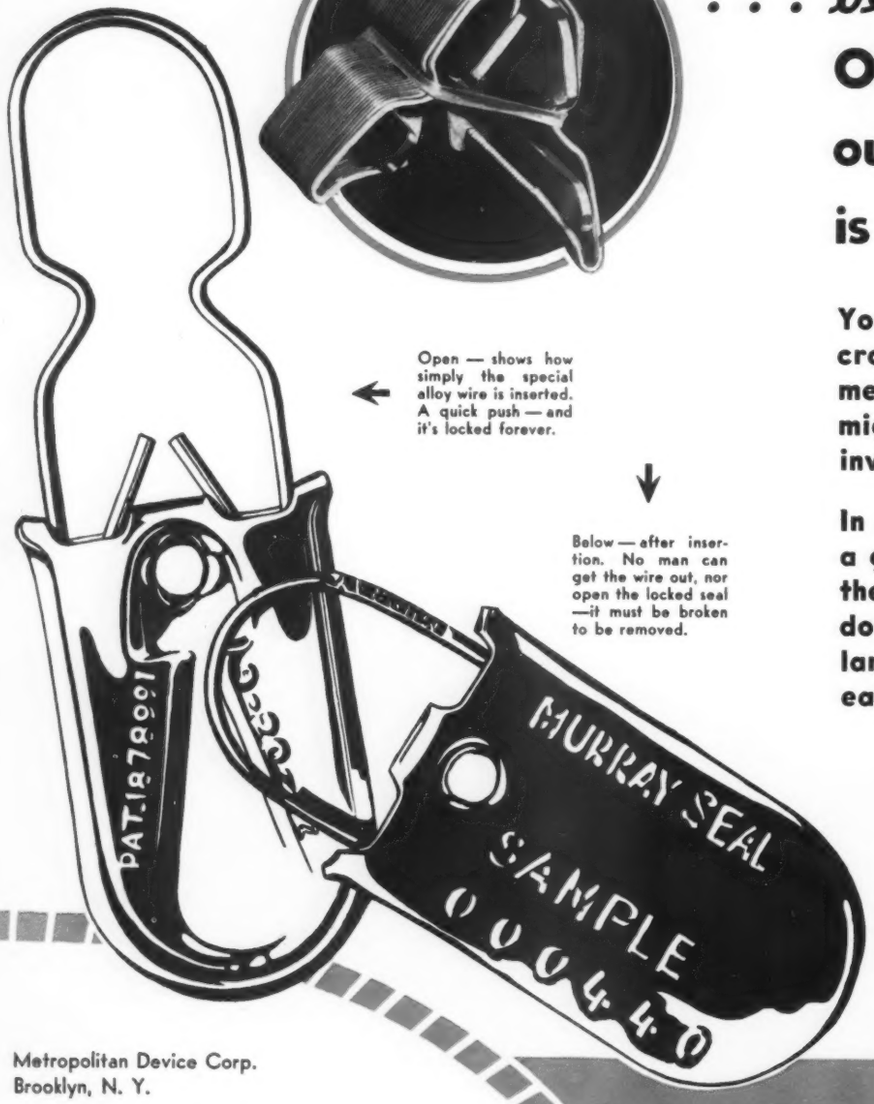

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ELECTRICAL WORLD

NOVEMBER 5, 1938

Bring Back Romance

A number of very interesting letters have been received commenting on our public relations editorial program, all showing marked interest in the subject and some offering suggestions. Among them was a most sincere letter from an executive of a Southern property, expressing the thought that one of the reasons for today's troubles is lack of inspiration and suggesting that perhaps the public might respond to a dose of inspiration from the lives of the electrical pioneers.

Our correspondent was right when he said that lack of inspiration is at the root of today's lack of confidence in the future. The answer, however, does not lie in the lives of yesterday's great. The story of Edison, or Bell, or Steinmetz, or Stanley, or Pupin, or any of the famous pioneers of our industry, who overcame great odds, fails to make any impression on the minds of today's discouraged youth, because, as they point out, and with some justification, times are different. They want to know not yesterday's opportunities, but those of today.

In our youth we had, in spite of our parents, the dime novel which fired our imaginations, made us want to be heroes, want to be pioneers, want to go to college, want to become captains of finance. And how did they do it? By setting up as examples boys just like ourselves.

Today there are no new frontiers in our country—no new rich lands to open. Our great pioneering work, with all of its wild glamour and opportunities to "strike it rich"—it lies behind us. In our bewilderment of the change this has wrought, we do not seem to know which way to turn.

And what is true of our country is doubly true of the electrical industry. Have not the rivers been tamed? the pioneering work done? the romance of "Slim" gone the way of Buffalo Bill? What is left to inspire our young men, the men to whom this industry must look for future guidance?

In other words, we are passing from the period of pioneering extravagance, not wastefulness but the plentifulness of natural opportunity, to a period of refinement, a period of intensification rather than extensification. The opportunities, contrary to common belief, are greater, but with this difference, luck and chance discovery will be succeeded by intensiveness of application.

It is essential, therefore, that the thinking of the young men be revitalized with a knowledge of today's problems, for it is in the solution of these problems that the great opportunities exist. We cannot put into their hands a Horatio Alger book on "Tim's Reward" or "From Meter Reader to Utility President." But we can, and truthfully, paint them a picture of the future of this industry, more extravagant in its concept than the dreams of any of our pioneers. We can point out current problems which need solution, whether they be finance, management, sales or engineering.

Some of these problems frighten present executives; maybe they will not be so terrifying to younger men who can bring to their solution fresh minds, unhampered by inhibitions. Did not many of our great pioneers make their greatest discoveries as young men? Surely youth of today is no less capable. We owe it to them and to ourselves, and to the future of our industry, to lay our problems frankly and fully before our young men.

If the scope of opportunity is measured by the intensity of the problem, there should be enough inspiration in the electrical industry to fire the imagination of every one of our worthwhile young men. Let's give them a chance. Let's state the problems. Let's encourage them to go forward. Let's bring back the romance of the electrical industry.

Large Increases in Usage From Commercial Lighting

By HARRY CURTIS

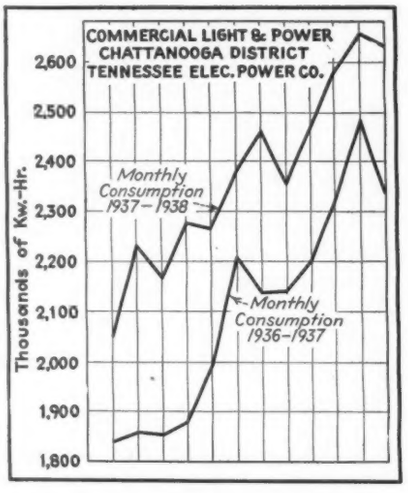
Manager Lighting Sales Department, Chattanooga Division, Tennessee Electric Power Company, Chattanooga, Tenn.

THE Chattanooga division of the Tennessee Electric Power Company consists of Chattanooga proper and the immediate surrounding territory and serves 30,489 residential meters, 4,047 commercial and small power meters and approximately 200 large industrial meters. The city of Chattanooga, which has a population of approximately 120,000 as of the 1930 census, is largely an industrial and railroad center having a trading radius of approximately 50 miles.

The commercial meters for sales work are divided into five groups of approximately 800 meters each. These are balanced as well as possible in regard to class of customers and potential lighting business. Taking into consideration the fact that approximately 30 or 35 per cent of these meters are for retail power use or are more or less inactive as far as sale of additional lighting is concerned, there are then approximately 500 commercial lighting prospects in each group of 800 meters. One commercial lighting salesman is assigned to each of these groups and has full responsibility for the sale and promotion of increased lighting in it.

Salesmen also handle problems with the customers in their territory involving rate explanations, complaints, etc. Periodically each salesman contacts all his customers with a view of securing prospects, creating good will and clearing up misunderstanding or problems that customers might have. He is constantly on the alert for any remodeling of stores, offices, etc., with the idea of selling the customer a modern lighting system.

When a salesman has secured a "hot" lighting prospect he determines, himself, whether the best method of selling the job is to make up blueprints and specifications for the customer or whether it is best to attempt to close the sale immediately. Should he decide that the latter is the better plan, he immediately offers the customer a demonstration installation in his place of business, with the type of equipment decided on between the customer and the salesman. When the customer agrees to such a demonstration the salesman gets in touch with an electrical contractor, who installs it. The company stands the expense of these trial installations.



Increases in monthly usage shown by all commercial lighting customers as a result of broad intensive selling by utility

When it is necessary, the salesman makes a blueprint of the customer's store, showing the location of the outlets, the spacing, type of units to use and also the wiring recommendations. He usually puts on the print the foot-candle intensity which will be secured with this installation. He then takes this print to the customer and tries to sell him on this particular installation. This procedure is necessary especially where rewiring and relocation of outlets is involved.

Even where blueprints and specifications are made on a job it is very often necessary for a salesman to make a trial installation to convince the customer that improved lighting is justified.

Each salesman is equipped with all the sales helps possible, such as visual proof material consisting of complete photograph album book of installations and testimonial letters, sightmeter, etc.

From time to time special campaigns are inaugurated by the general sales office to create additional incentive and enthusiasm.

Every opportunity for the past several years has been used to promote the use of high levels of illumination. This has been directed at all classes of customers. Some of the methods used are: Newspaper advertising, meetings and demonstrations, playlets, various fairs, Better Homes shows, teachers' conventions, etc., cooperation with social groups, contact with architects, electrical dealers, contractors and distributors, etc.

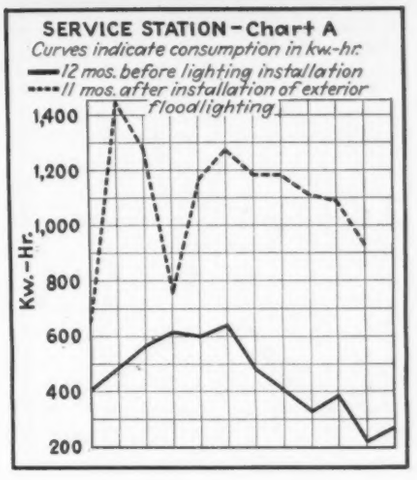
During the period March 1, 1937, to March 1, 1938, a total of 3,194.4 kw. in additional lighting was sold and installed in the Chattanooga division. This lighting was as follows: Signs and exterior displays, 491.2 kw.; show windows, 219.6 kw.; store interiors, 1,715.5 kw.; schools, public buildings, and churches, 543.1 kw.; offices and theaters, 200.9 kw.; miscellaneous, 24.1 kw.; total, 3,194.4 kw.

Co-operation with architects

Very close contact is maintained with architects. They are all known personally by the members of the commercial lighting department.

"Stopping" power and sales increased after remodeling and relighting of service stations as shown here

Previous installation had exterior lighting load of 1,500 watts. Job when completed (shown at right) has load of 5,300 watts of h.t. mercury vapor and Mazda floods. Increased usage of electric service shown on chart A.

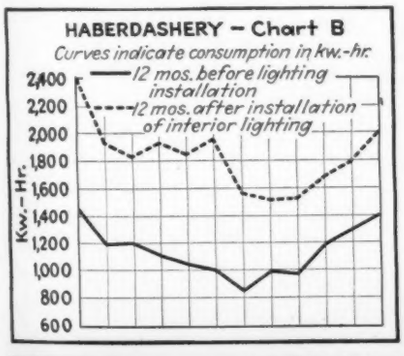


They are supplied with Illuminating Engineering Society data sheets and various new lighting information from time to time as it comes out. As soon as any remodeling job or new building is contemplated contact is made with the architect and the assistance of the department is offered in making lighting layouts.

Very satisfactory results have been secured through this work with the architects and they usually call in for a lighting engineer to assist them in planning the lighting on various buildings they are designing. The architects generally realize that our lighting engineers are competent to help them with their specifications and that they will study the problem from the angle of the lighting requirements for the particular type of job, taking into consideration all the economic factors involved.

Another reason for the fine co-operation existing with architects is the fact that the salesmen are in constant touch with the customers and the architect knows that he will be "in" on the job and feels that it is to his advantage to let him in on the ground floor.

Special efforts have been made to get each architect's office properly lighted and good results along that line have been obtained. In addition, whenever there is any meeting or demonstration pertaining to lighting, we make it a point to see that the architects are invited, and they, in turn, have responded to these meetings exceedingly well.



Contractors' co-operation

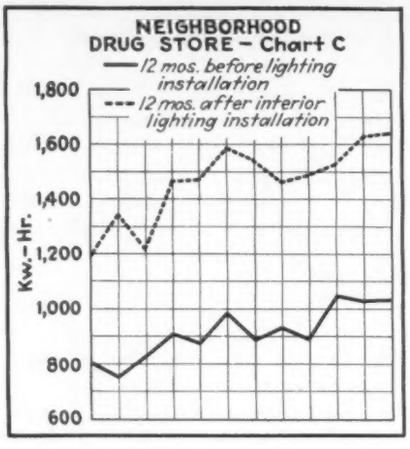
In closing, our general picture might well be rounded out more completely perhaps by a few observations upon the co-operation we have secured from contractors and distributors.

Typical medium size suburban store presented dual job of selling rewiring after customer had been sold on modern lighting

Five 300-watt lamps were supplanted by ten 500-watt lamps and increased usage is shown in chart B.

Another typical job presenting the typical additional difficulty of rewiring. Actual demonstrations necessary to consummate these sales

Original job (on left) utilized three 600-watt lamps, but 25 ft.-candles were secured by use of eight 300-watt lamps (shown on right). Chart C shows resulting increased consumption.

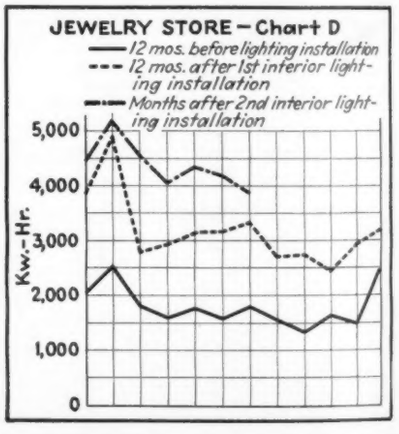


Not all of the electrical contractors have believed that the customer needed the amount of lighting that was recommended, but this condition has been overcome to a large extent by the customer who bought the lighting and willingly paid the cost of equipment and increased operation to secure the tangible benefits of better and modern lighting.

This has made the contractor realize more than anything else we have done that it is really something the customer wants and needs and considers well worth the price. Results along this line have been obtained during the past year to the extent that many of the contractors accept the recommendations of the commercial lighting salesmen and stick by them and try to sell the job as recommended.

Constant contact is maintained with both the electrical contractors and electrical distributors through the Electric League of Chattanooga, keeping them informed of various developments and activities in lighting. They are apprised promptly of the various lighting programs and activities of the league which are carried on for their promotional and educational value.

During the past year all the distributors and a large number of the contractors have installed improved lighting and wiring in their offices and display rooms. This is a very commendable, forward step on their part and indicates that they are sold on the value of higher levels of illumination and that in the future they will do a much better job of selling lighting to their prospective customers.



A still different type of job is presented by this downtown jewelry store which was relighted twice. And Chattanooga has many jobs of successive relighting

Original lighting installation consisted of 1,600 watts (shown at left), and after second relighting job (at right) there is 7,000 watts in indirect-direct luminaires and supplementary lighting in rear using 40 watt lamps on 12-in. centers. Consumption curves for the three steps are shown in chart D.

Controlling Accuracy in Voltage Surveys

By F. K. McCUNE and A. J. CORSON
General Electric Company, West Lynn, Mass.

USERS of electric indicating instruments, particularly instruments for voltage-survey work, are showing an increasing interest in the accuracy of test results. Specific reference is made to the article entitled "Winter Voltmeter Errors Befog Regulator Settings," by Bloomsburg, appearing in the December 18, 1937, issue of ELECTRICAL WORLD, as evidence of this interest. This article will briefly discuss the general requirements of these instruments and will also cover in some detail the problem of temperature influence on voltmeters used for voltage surveys.

The user is largely concerned with temporary errors, which may be due to some local condition and which would not show in the calibration check of the instrument. The remainder of this discussion will be devoted to a brief analysis of such conditions.

Operating conditions

Readings obtained from voltmeters are influenced by numerous disturbing conditions, such as changes in frequency and wave form of the applied voltage, changes in position of the instrument, changes due to external magnetic fields, changes in the temperature of the instrument, changes due to instrument heating caused by the voltage applied, and personal reading errors. In voltage survey work, however, all of these factors are small and will cancel out over a large number of observations, with the notable exception of temperature variations. Since instruments are often calibrated in the laboratory at room conditions but are used in very cold weather outdoors, and since there is no time to allow for self-heating errors when taking readings in the field, these factors may introduce consistent errors throughout a whole day's reading. Errors due to temperature variations thus require special study, and it will be shown how, by special-purpose design, satisfactory performance can be obtained.

Ambient temperatures

Consider an instrument calibrated at some temperature (T^1) and used at a different temperature (T^2). A change in indication will take place for two reasons:

First, the current through the instrument changes because the instrument resistance changes with temperature; and, second, the effect of a given value of current as measured in pointer deflection will change. The resistance changes because the electrical circuit of moving-iron voltmeters consists essentially of a field coil wound with copper wire connected in series with a fixed resistor. The temperature coefficient of the fixed resistor (R^1) should be very close to zero, while that of the copper coil (R^2) is about 0.4 per cent per degree C. or 0.22 per cent per degree F. If the ratio of copper to total resistance is calculated, then the variation in current through the instrument will be the product of this ratio multiplied by α_2, the temperature coefficient of copper. In an instrument having 10 per cent copper the current will, then, vary about 0 04 per cent per degree C. change.

Two changes occur within the instrument itself, exclusive of the current:

First, every type of element has a certain change in its torque-producing ability for a given current due to temperature changes. By proper design, based on accurate tests, and by thoroughly good workmanship, this error can be kept small. More important, it is kept consistent between instruments.

The second change is in the elastic coefficient of the instrument spring. This is greater, being in the order of 0.03 per cent per degree C. and in a direction opposite to the change caused by variation in resistance with temperature. Since the error due to the spring is considerably greater than that due to the inherent variations in the element, the net result is that the temperature error of the element is positive and consistent.

Comparison of Constants—General-Purpose and Special-Purpose Voltmeters

0—150-Volt Instruments

	General-Purpose Instrument	Special-Purpose Instrument
1. Instrument resistance (ohms)...	25,000	10,000
2. Ratio of copper to total resistance (5)	14.2	5.5
3. "Ohms-per-volt" sensitivity	167	67
4. Self-heat variation at 150 volts (per cent of full-scale reading)	—0.6	—0.1
5. Ambient-temperature variation per cent per deg. C. (a)....	—0.033	±0.01

There is, therefore, an ideal percentage of copper at which exact ambient temperature compensation is obtained. It is important, however, that this statement applies to only one value of resistance. For a double-rated instrument the percentage for copper in the field coil is different for each rating; therefore, theoretically perfect compensation cannot be obtained by this means. It is equally true, however, that the compensating copper ratios are usually so low in value that the addition of a limited amount of series resistance will not materially upset the compensation. If the effect of adding series resistance is material in the final design, it can be easily taken care of by making the additional resistance of the proper temperature coefficient, or by using a tapped field coil and transfer switch. This limitation is not, therefore, serious where the ratio between full-scale values is not more than, perhaps, 2:1.

There is a further limitation which must be considered when all parts of the instrument are not at the same temperature. Where compensation is effected by a copper coil placed close to the control spring, it is quite apparent that the spring will change temperature faster than will the coil. This is due to the fact that the spring is more exposed and has a much

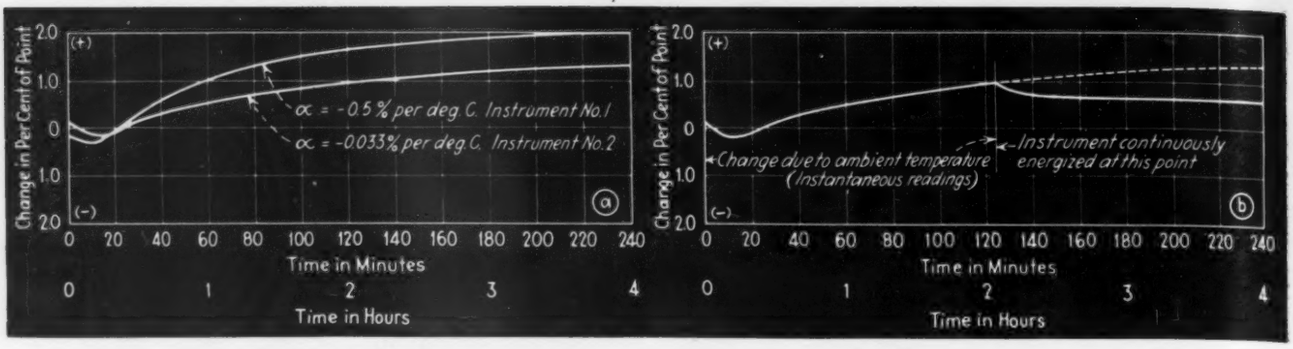


Fig. 1—Temperature variations of general purpose portable voltmeter

(a) Two types compared. Ambient temperature changed from 21 deg. C. to 19 deg. C.
(b) Variation due to self-heating superposed on ambient temperature characteristic.

lower thermal capacity. The temperature variation of two different types of general-purpose instruments is illustrated in Fig. 1a.

Readings were taken immediately after the transfer and then every few minutes, and the results plotted as a function of time. The curves show that at the end of three hours one instrument showed an error of about 1¼ per cent and the other almost 2 per cent. However, the one which showed an error of 2 per cent showed an error of only 1 per cent at the end of one hour, while the other showed ½ per cent. Furthermore, in the first few minutes the instruments show an error in the opposite direction since the spring is changing temperature rapidly, while the other parts change their temperature much more slowly.

The question at once arises as to what type of curve (Fig. 2a) to expect for an instrument designed to have a very low temperature coefficient. It can easily be seen that compensation is reasonably exact, not only for the ultimate temperature condition but also during the transient state when the instrument is changing from one temperature to another.

When voltage is applied to the instrument the effect is to produce a certain amount of heating inside the instrument. The major portion of this heat occurs in the resistance spools, which in turn warm the air inside the case. The field coil may also have a slight temperature rise due to its resistance. In general, then, the field-coil temperature will be slightly higher than the ambient inside of the case, while the instrument spring will be at a slightly lower temperature.

Despite the fact that unequal temperatures exist, it is very significant that a careful balance of constants from a viewpoint of ambient temperature change will likewise effectively take care of variations due to self-heating. This is shown by Figs. 1b and 2b. The resultant total variation of the instrument due to temperature is obtained by simply superimposing the self-heat variation curve on the ambient temperature curve. It is very clearly shown that in the case of the balanced instrument the total variation is very small for any condition of ambient or self-heat.

Effect of compensation

The question at once arises, why not design all instruments for very low ambient-temperature errors? From a designer's viewpoint this is not entirely practical, since in order to obtain best performance on temperature some other characteristic must be sacrified. In voltage survey work the "ohms-per-volt" sensitivity, which determines the current taken by the instrument, is of relatively little significance. The improvement in ambient-temperature performance has been made at the expense of this characteristic as shown in the accompanying table. This table lists only the variables involved in the temperature-compensated instrument. No change in torque, factor of merit or responsiveness has been made.

Calibration for wide temperature ranges

It can be seen from the curves that if the instrument is not particularly designed for low ambient-temperature errors laboratory tests and corrections obtained for them may be somewhat unreliable unless they are made at the exact temperature at which the instrument is to be used and the instrument is maintained at this temperature at all times. For example, if an instrument were calibrated in the laboratory at 0° F. and were to be used at 0° F. its cali-

[*Continued on page 112*]

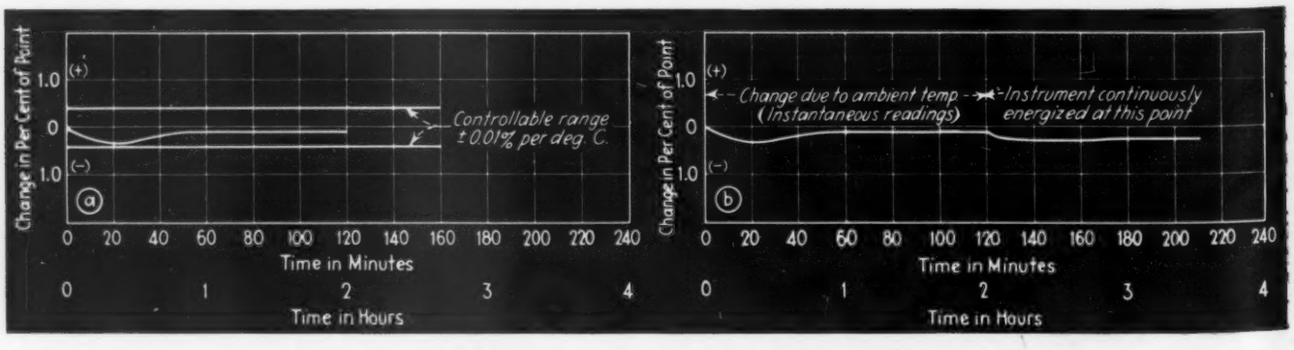


Fig. 2—Special purpose voltmeter has reduced temperature departures

(a) Ambient temperature changed from 21 deg. C. to 19 deg. C. (b) Combined ambient temperature and self-heat variation.

Tap Line Built to Defy Heavy Glaze

By H. E. JUNG

Engineer Distribution Division, Southern California Edison Company, Ltd.

TO FURNISH reliable service and to overcome a condition of particularly heavy loading, the Southern California Edison Company has resorted to a type of construction several features of which are not standard practice. The salient points of this construction are:

1. Triangular configuration.
2. Poles banded to prevent splitting from vertical loads.
3. Short spans.
4. Solid copperweld wire.
5. No splices.

This construction was used to rebuild a 6,500-ft. section of three-phase, 11-kv. line which had gone out of service with monotonous repetition each winter. The line is located near the crest of the San Bernardino Mountains. Cloud formations, blown inland across the mountains, condense and the ice accretion on wires becomes very heavy, record diameters being 8 in. with a vertical load of about 20 lb. per lineal foot. Recorded wind velocities reach 80 miles per hour at Forest Service stations, some distance away. The result has been a portion of line almost impossible to maintain.

To remedy this condition it was decided to reroute, as much as possible, the portion of the line subjected to the heaviest loads to a location where loads would be less severe. This was accomplished by dropping the line farther below the crest on the lee side, adding 600 ft. to the total length of line. Loads in the new location are estimated to be limited to 2 in. of radial ice and 60-miles-per-hour winds (or 9 lb. per sq. ft. at 0 deg. F.). The resultant load is 6.9 lb. per lineal foot on the conductor employed.

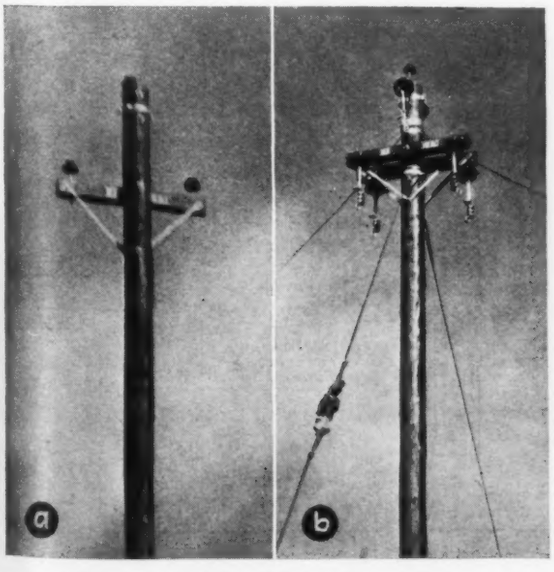
In designing the rebuilt pole stresses were reduced by limiting pole lengths to 35 ft. and span lengths to 150 ft. When the new route was selected the character of the ground limited spans to 140 ft.

Triangular configuration was employed to reduce crossarm stresses and conductor spacing was limited to the minimum allowed under California law. This procedure reduced stresses to values at which portions of standard ($3\frac{3}{4}$ x $4\frac{3}{4}$-in.) crossarms could be used.

Experience with heavy ice loads also led to banding the poles directly beneath the crossarms to overcome splitting of poles by through-bolts.

The poles were selected Douglas fir, full-length creosote treated. Douglas fir was chosen for strength and grading was to insure a minimum ground-line diameter of 7 to 9 in. to accommodate pole bands.

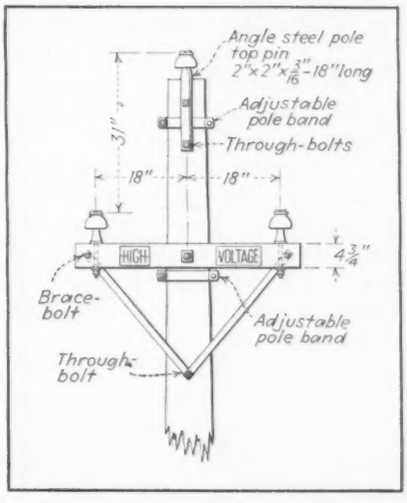
[*Continued on page 113*]



Pole top of the reinforced construction

(a) Tangent structure of new line. (b) Angle dead-end structure, new line.

Tangent construction—material being trammed by aerial cable



Configuration employed on the reconstructed line

Flat braces for crossarms were attached to poles with through-bolts, the customary brace bolt through the crossarm having the added virtue of a split-bolt outside the insulator pins. The split bolt effect was required to overcome crossarm splitting when ice loads slide down sloping spans. Insulator pins are steel, ¾ in. in diameter and 4¾ in. from spread of base to end of thread.

The pole bands are a standard hardware item and are adjustable between 7 in. and 8 in. diameter. Earlier attempts to avoid splitting of poles by through-bolts, if the conductors or poles stayed up long enough, used an additional through-bolt parallel to and below the crossarm. But the result was that poles, instead of splitting into halves, split into quarters. The upper conductor is supported by a 2x2x3/16 in. angle pin, 18 in. long, fastened to the pole with two through-bolts. A pole band is also used at the top of the pole, being placed around the pole under the angle pin and between the through-bolts.

By W. B. BOAST

City of Ames
Engineering Department,
Ames, Iowa

Combination Units Light Arterial Underpass

MERCURY and incandescent lamps were chosen to light a sequence of underpasses on an important arterial highway close to its junction with the Lincoln Highway. A 400-watt mercury-vapor lamp is used in conjunction with two 100-watt incandescents. This can be seen from the accompanying tabular analysis to present the lowest over-all cost per million lumen-hours.

A plan of street lighting for a commercial district of this nature must provide a very adequate element of safety and convenience through adequate visibility. A method of part-night and all-night service is provided to accomplish this adequate lighting at a reasonable cost (Fig. 1). During the evening hours, when traffic is heavy, all units operate at their full capacity.

Lumen rating of each unit

The lighting of the thoroughfare has been designed for heavy traffic conditions during the evening hours. The rating of each unit was chosen as approximately 19,000 lumens after consideration of the selection of the light source. Switching (Fig. 3) permits rating to be decreased at midnight to either 15,000 or 4,000 lumens. Two-hundred watt incandescent lamps are used in the dome units under the bridges.

Costs were calculated as shown in the table on the basis that some type of incandescent or combination mercury-vapor and incandescent lighting unit would be used. Inasmuch as pe-

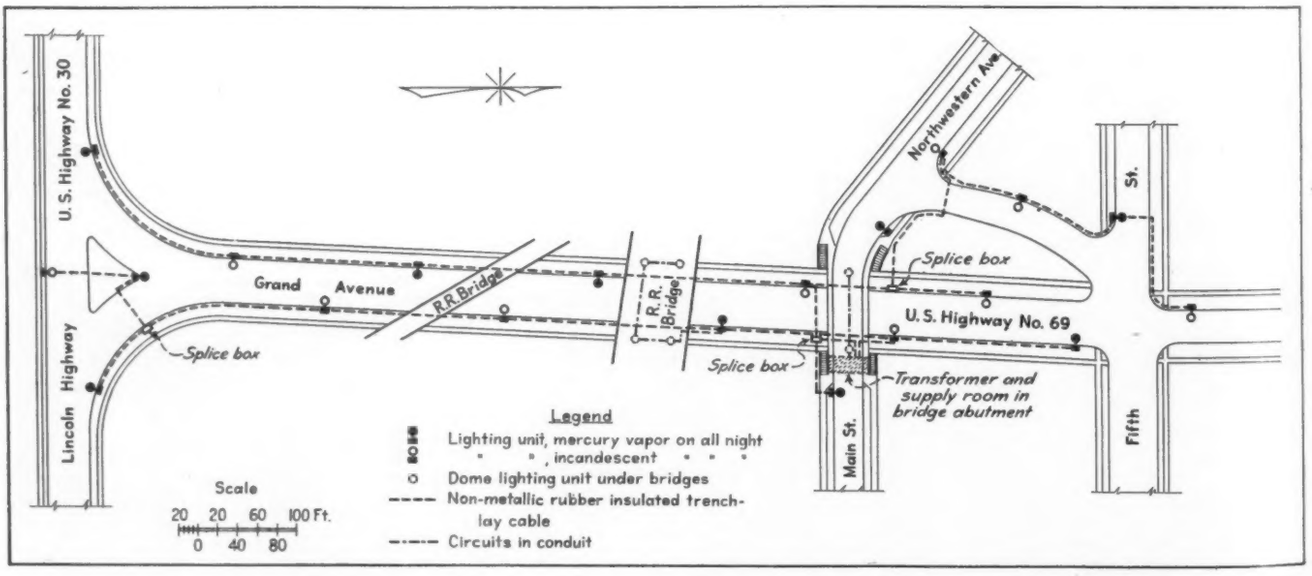


Fig. 1—Two-level lighting provided

A rather definite location of units was imperative because of the peculiar nature of streets and bridges to be lighted. Each unit serves its own individual purpose. Staggered spacings of 90 to 125 ft. on the 40-ft. roadway have been the goal throughout. Units surrounding the Main Street bridge over Grand Avenue have been placed with particular reference to the stairs leading from the Main Street sidewalk to the sidewalk level of the underpass.

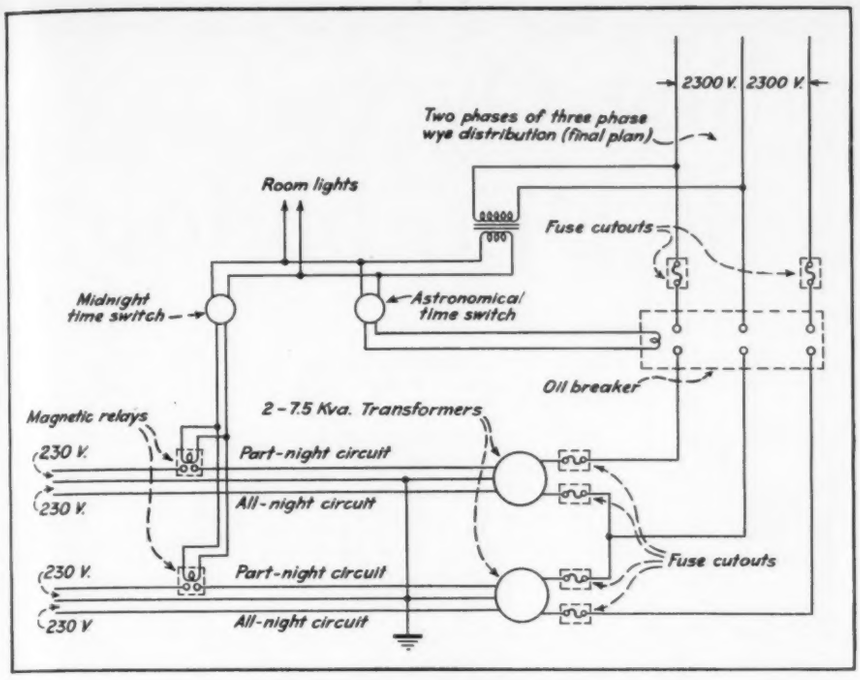


Fig. 2—Circuits and supply transformers

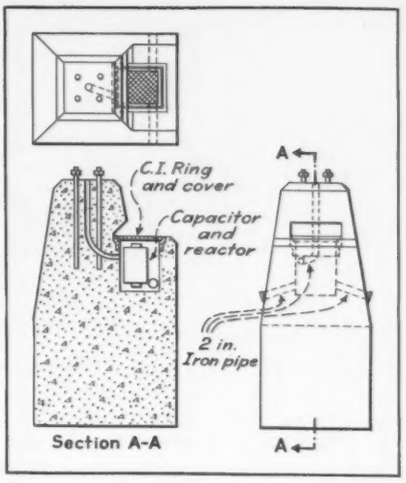


Fig. 4—Splice box in the concrete foundation of the pole

destrian traffic is one important factor in this installation, sodium-vapor lighting was not considered.

A study of the table will indicate that the use of the 400-watt mercury-vapor lamp in combination with incandescent lamps gives the lowest total cost of light production and with consideration of all other factors was the type of light source chosen.

Electrical Distribution—Secondary distribution is accomplished through two three-wire, 230/460-volt grounded neutral circuits. A completely rubber insulated 600-volt trenchlay cable was used. Conductor sizes on these circuits vary from No. 4 to No. 8, depending upon the loading and the length of run. The mercury-vapor and the incandescent lamps are placed on opposite sides of the neutral in each unit.

Control—A system of part-night control is used for reducing the light output of the units after midnight. The control is accomplished by dropping one side of the three-wire circuit through a time clock and relay mechanism. The mercury-vapor units are placed on the part-night side of the system wherever feasible. However, at intersections and at certain locations between and adjacent to the bridges the mercury-vapor lamps are placed on the all-night side of the system.

Initial and final switching of the complete system is accomplished through a three-pole RCOC oil breaker controlled by a time clock with an astronomical dial.

The accompanying headpiece was taken at the eye level of the driver.

The color correction afforded by the two 100-watt incandescent lamps in each unit is proving quite satisfactory. No noticeably ghastly effects upon an individual's countenance are apparent, although true color effects of course are not obtained. If further correction is later deemed advisable two 200-watt incandescent lamps will be substituted.

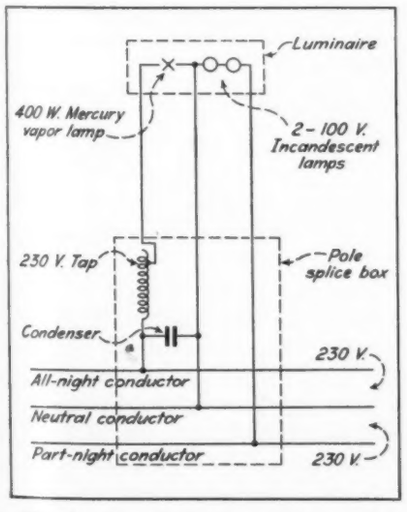


Fig. 3—Two incandescents in series with mercury

Two 115-volt incandescent lamps are used in series on the incandescent side of the circuit. This procedure accomplishes two results: First, the lower voltage lamp produces more lumens per watt; second, the failure of one incandescent lamp causes both lamps to be extinguished. Consequently a more complete visual indication of the failure results than if one incandescent lamp continued to burn together with the mercury vapor.

Lumen-Hour Costs for Street Lighting

(Distribution costs are not included)

		Combination Mercury Vapor and Incandescent			
	Incandescent	400-w. Mer. 2 100-w. Inc.	400-w. Mer. 2 150-w. Inc.	250-w. Mer. 2 100-w. Inc.	250-w. Mer. 2 150-w. Inc.
Total lumens per fixture	15,000	19,000	21,000	10,500	12,500
Total watts per fixture	750	640	740	480	580
Average lamp life (hours)	2,000	2,000 (M) 1,000 (I)	2,000 (M) 1,000 (I)	2,000 (M) 1,000 (I)	2,000 (M) 1,000 (I)
Initial cost per fixture	$43.50	$52.00	$52.00	$52.00	$52.00
Initial cost per standard	$100.00	$100.00	$100.00	$100.00	$100.00
Initial cost of lamps, each	$1.30	$10.75 (M) 0.15 (I)	$10.75 (M) 0.20 (I)	$6.00 (M) 0.15 (I)	$6.00 (M) 0.20 (I)
Annual burning hours	4,000	2,000 (at 640w) 2,000 (at 440w)	2,000 (at 740w) 2,000 (at 440w)	2,000 (at 480w) 2,000 (at 280w)	2,000 (at 580w) 2,000 (at 280w)
Number of lamps required per year	2	2 (M) 4 (I)	2 (M) 4 (I)	2 (M) 4 (I)	2 (M) 4 (I)
Quantity of light in million lumen-hours	60	68	72	34	38
Interest on investment at 6%	$8.61	$9.12	$9.12	$9.12	$9.12
Depreciation at 5%	7.18	7.60	7.60	7.60	7.60
Lamp replacement cost	2.60	21.50 (M) 0.60 (I)	21.50 (M) 0.80 (I)	12.00 (M) 0.60 (I)	12.00 (M) 0.80 (I)
Annual electrical energy cost at 3¢	90.00	64.80	70.80	45.60	51.60
Total annual cost	$108.39	$103.62	$109.82	$74.92	$81.12
Cost per million lumen-hours	$1.81	$1.52	$1.52	$2.20	$2.14

Cutting Over to Network Distribution

By PHILIP BROWN
Assistant Engineer Department of Public Utilities, Tacoma, Wash.

PROVIDING downtown Tacoma with a modern, underground distribution system was a job begun by the Department of Public Utilities in 1935. Through three well-depressed years the replacing of antiquated aerial with underground network has proceeded, and this fall finds Tacoma's central business area enjoying a service which is both reliable and sightly. The new network, which is three-phase, four-wire, 120–208-volt, replaces not only overhead but also a dual—power and light—underground energized 1926.

Load in the cut-over area is 77 per cent light, 23 per cent power, similar to that in other cities of about the same size. Connected are some 13,000 kw., with a 6,000-kw. winter peak. Slopes tend to eliminate trouble from water. General layout appears in Fig. 3.

Network and feeders, which are carried in a fifteen-duct bank from Nisqually substation, are shown in Fig. 4. Fig. 5 shows a typical vault. Present demand plus estimated load growth dictated vault size, providing ample space for future capacity.

Physical construction (Fig. 6) proceeded without difficulty, despite the fact that some labor was inexperienced. In the poorest years delinquent customers were allowed to work out their bills by labor on vaults and manholes.

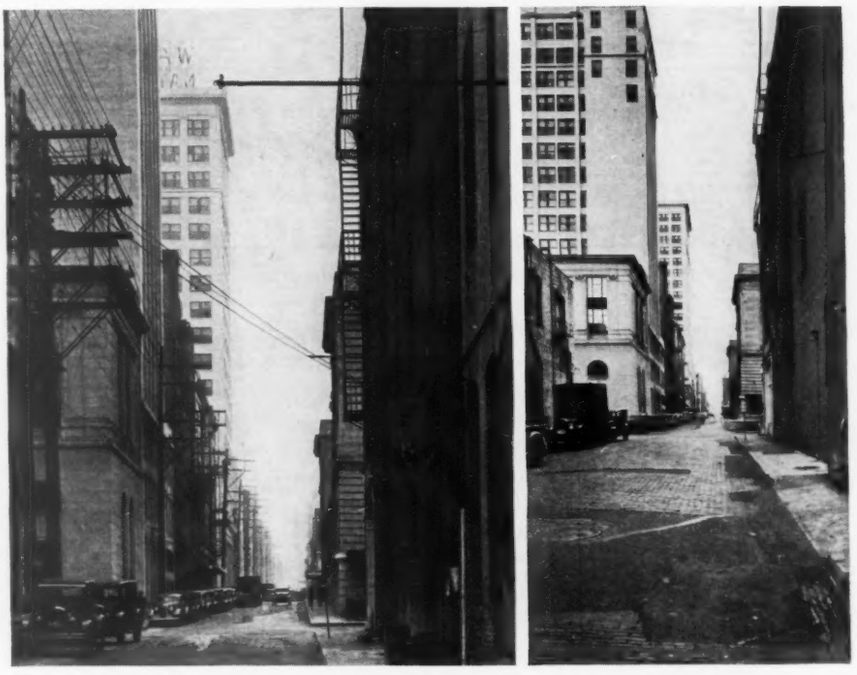


Fig. 1 (Left)—Typical of overhead replaced by underground construction. Fig. 2 (Right)—New underground network improves service and adds attractiveness to streets. Compare this scene with the same view, Fig. 1

Primary feeders

Service to the network is through four 4,160–2,400-volt, three-phase, four-wire, 350,000-circ. mil feeders from Nisqually substation and four similar feeders from steam plant No. 1. Two of the four main feeders from Nisqually consist of three-conductor, 350,000-circ. mil cables and the other two of three single-conductor, 350,000-circ. mil cables. Used in all cases is corona-resisting oil-base compound, 5,000-volt rubber insulation, unshielded and non-leaded.

Near network center, these connect to three-conductor, No. 4/0, paper-insulated, lead-covered cables running the full length of Commerce Street. Branches, consisting of three No. 1/0 (No. 4's for vault branches) conductors, feed to both sides.

Network cables

Two single-conductor, 250,000-circ. mil conductors per phase form the new network. Each set of cables is located in separate ducts, two being used because burn-off characteristics are lower and current-carrying capacity higher. Insulation is 8/64 in. of mineral-base, 60 per cent rubber compound, reduced to 6/64 in. where tape and braid are used. Connection to old underground cables is made through limiters (Fig. 7).

On passing 1,840 amp. through the 250,000-circ. mil conductor it was found that insulation softened in 4½ minutes, melted in six to seven minutes and fell off, but did not ignite, though the cable was red hot, in sixteen minutes. Limiters tested at the same current blew in 1.5 to 1.6 minutes. This indicated the limiters would afford satisfactory protection at currents above 1,500 amp. Cables were fireproofed, however, as a protection against external heat.

Along Commerce Street one 750,000-circ. mil, paper-insulated, lead-covered cable forms the primary neutral, while two No. 2/0 weatherproof wires are used elsewhere. Grounded at each manhole and vault, all are carried in a separate duct from the feeder phases.

Secondary neutral, on the other hand, consisting of two No. 4/0

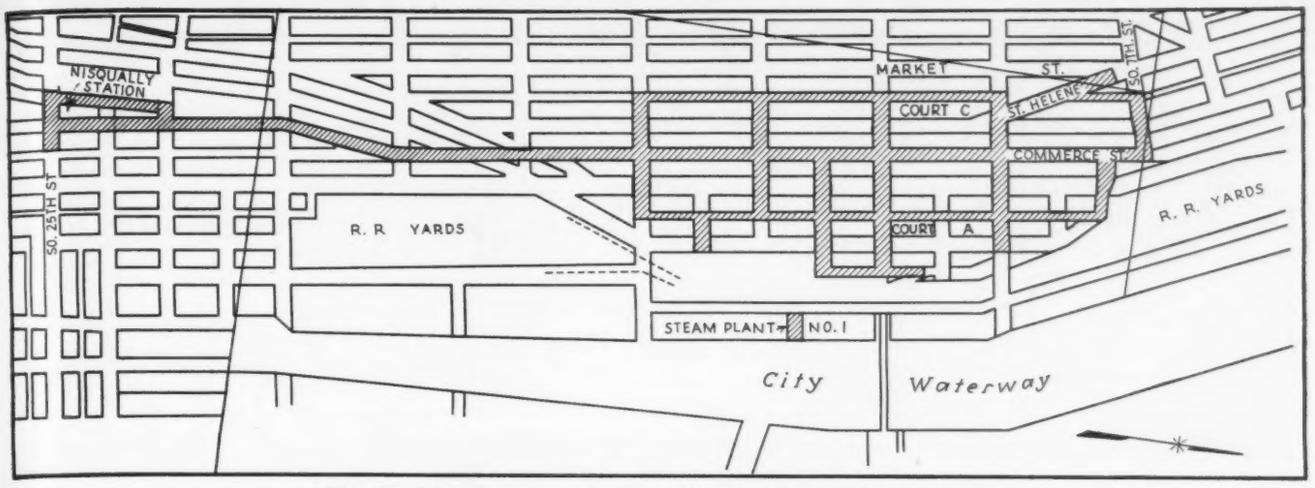


Fig. 3—District cut over to network, showing sources of supply

weatherproof wires, is buried in some cases, run one per secondary-phase duct in others. These likewise are grounded at vaults and manholes and are tied to the primary neutral as well.

Secondary neutral of this size was used for the reason that most network faults were found to be single phase, or quickly to develop into such. This reasoning alone would specify a neutral equivalent in size to a phase cable. Two factors led to use of the smaller size. One was the use of limiters, the other was the fact that primary and secondary neutrals are

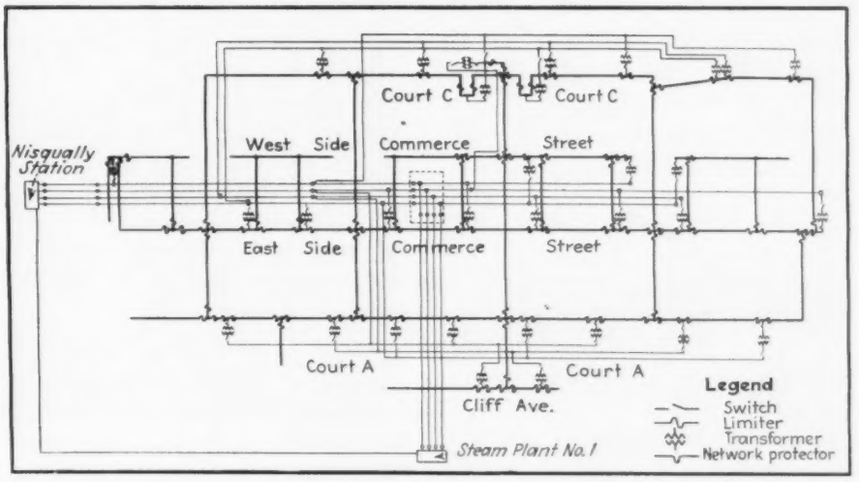
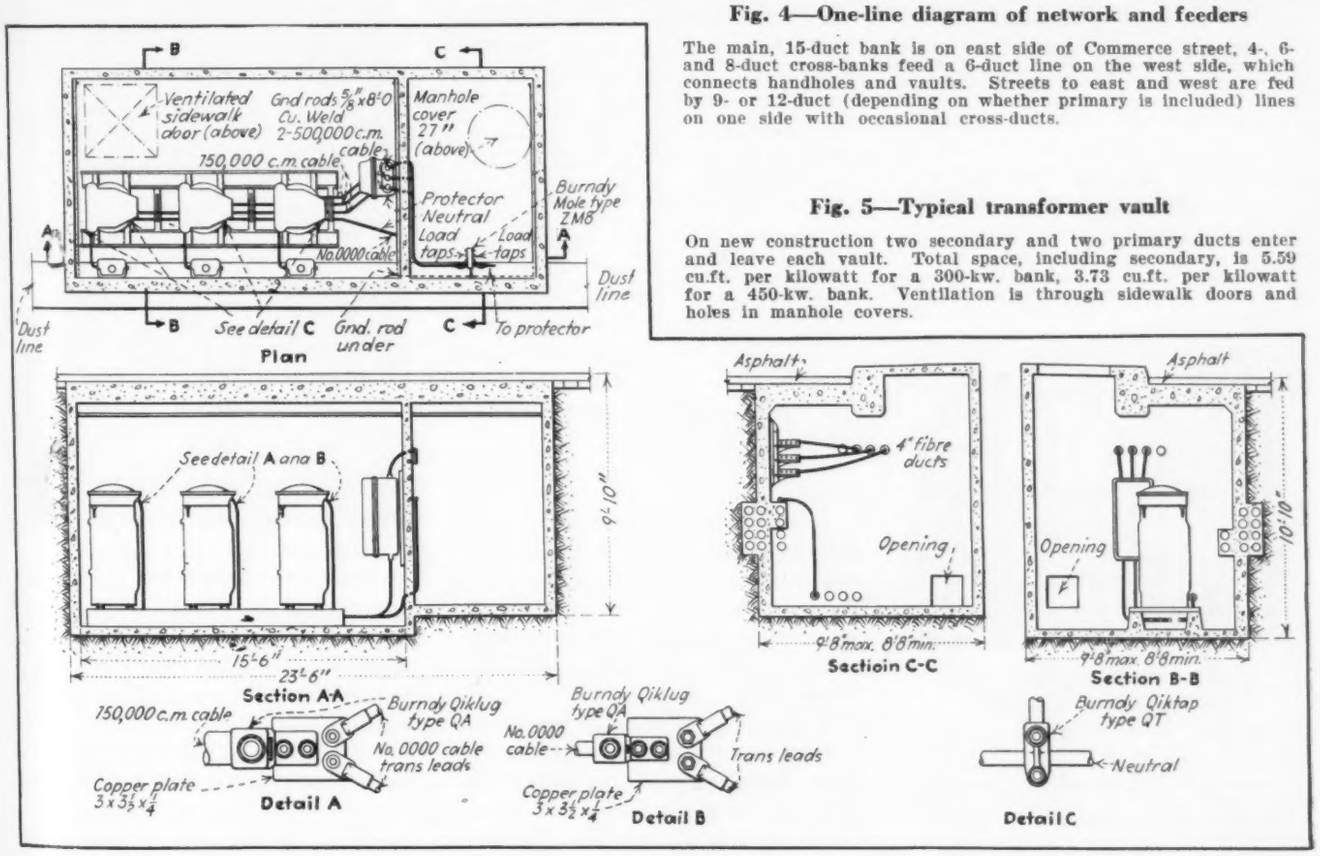


Fig. 4—One-line diagram of network and feeders

The main, 15-duct bank is on east side of Commerce street, 4-, 6- and 8-duct cross-banks feed a 6-duct line on the west side, which connects handholes and vaults. Streets to east and west are fed by 9- or 12-duct (depending on whether primary is included) lines on one side with occasional cross-ducts.

Fig. 5—Typical transformer vault

On new construction two secondary and two primary ducts enter and leave each vault. Total space, including secondary, is 5.59 cu.ft. per kilowatt for a 300-kw. bank, 3.73 cu.ft. per kilowatt for a 450-kw. bank. Ventilation is through sidewalk doors and holes in manhole covers.



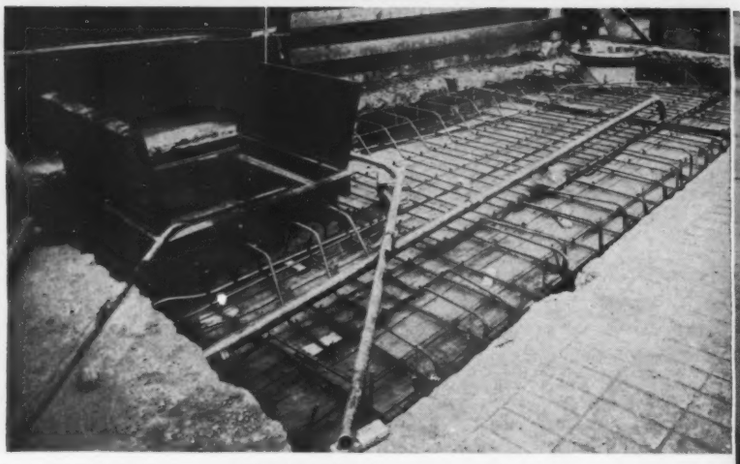


Fig. 6—Vault construction

Design loading was 14,000 lb. concentrated with 40 per cent impact for street structures, 250 lb. per sq.ft. distributed for sidewalks.

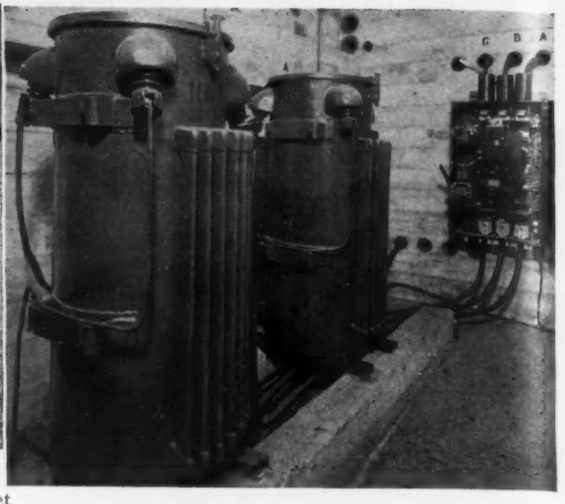


Fig. 11—Primary part of vault

tied. On services, however, neutrals are the same size as phase wires. Each manhole has four and each vault six copperweld ground rods, tied together with No. 2/0 weatherproof wire.

Splicing practice on primary feeders was to wipe a split sleeve, insulate with compound rubber tape plus three or four layers of friction tape and apply a coat of P & B paint. On secondaries bolted fittings were used for services. Through splices on phase cables were made with tubular copper conductors, dented by hydraulic press. Neutral joints were soldered.

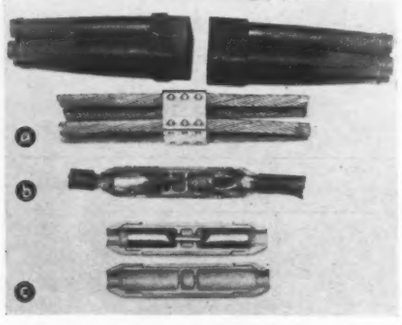


Fig. 7—Crabs and limiters used

(a) Crab joint consisting of 2-in. copper cube with holes accommodating four 250,000-circ. mil conductors. After cable ends are pushed through 12 in., the cube is dented by hydraulic press. The rubber cover is eventually taped and painted with P&B. (b) Limiter, showing split electrobestos shell with arcing chamber. Length and area of the fusible section determines rating.

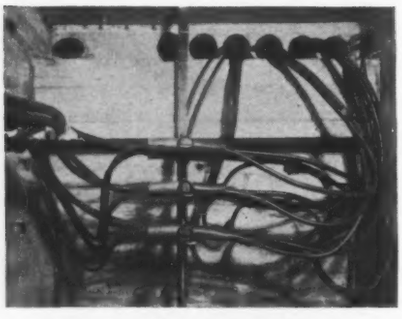


Fig. 8—Mole installation in secondary part of vault

Mineral-base, rubber compound insulation was selected for low moisture absorption, high tensile strength, toughness and service record. Rubber insulation also was effective in facilitating splicing and forestalling electrolysis and downhill migration of oil.

Vault equipment

Each vault contains three transformers and submersible network protector. Transformers are outdoor type, rated 100 kw., 2,400/120 volt, 3.5 per cent reactance. Protectors are rated 1,200 amp., are either General Electric or Westinghouse, latest type, and are mounted in the transformer compartments. Connection is by 800,000-circ. mil rubber-covered cables.

Cutover experience

Present activity is concerned principally with converting old to new underground. The aerial cutover is completed. Small services were changed by day during the week. Large services were cut over on Sundays or at night, as the customer wished. This method proved satisfactory, and no changes are contemplated.

Incidental to the main job is the placing of booster auto-transformers where voltage difficulties were encountered and the replacing of old series street lighting with a multiple system employing 300-watt, 120-volt luminaires.

In operation of the network itself, two primary single-phase feeder faults have occurred. In both cases back-up fuses on protectors blew, but protectors did not trip out. The

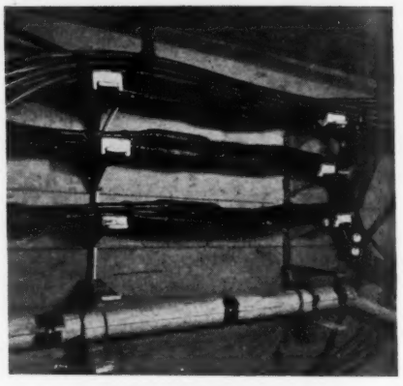


Fig. 9—Crabs and limiters installed in junction manhole

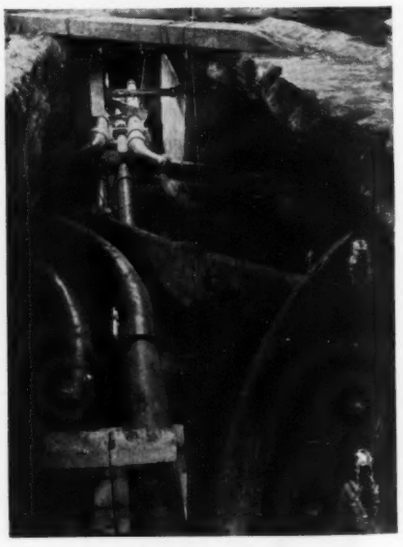


Fig. 10—Duct line turn-out to handhole

belief being that reverse current in the faulty phase was lagging network voltage, reversed, by close to 90 deg., and therefore did not produce enough negative torque on the network meter disk to counteract that from the two good phases, feeder O.C.B. relays at the substation were moved from 0.4

[*Continued on page 117*]

Plate Rectifiers Take On Four-Figure Amperes

By I. R. SMITH

Control Division, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

USE of sprayed metal instead of lead washers under pressure for collecting the current from individual plates has greatly increased the size and output capacity of copper oxide rectifiers. The resulting plate rectifiers extend the service range of the older disk type, but do not supplant the latter. It presents again in enlarged scope the recognized advantages of the copper oxide rectifier:

1. No moving parts.
2. No maintenance or repairs required.
3. Dry, metallic rectifying elements.
4. Nothing to wear out.
5. Rugged elements, containing no glass or fragile parts.
6. Noiseless in operation.
7. No special foundations required for installation.
8. Completely assembled when shipped.
9. No separately mounted parts, control, etc.
10. No lining up or mechanical adjustments needed before operating.
11. No warming up period; full load can be carried at once.
12. Operation is instantaneous, no time lag or transient condition in starting.
13. High efficiency over wide range of load.
14. Near unit power factor.
15. Voltage adjustments made by changing transformer ratios; no rheostatic losses.

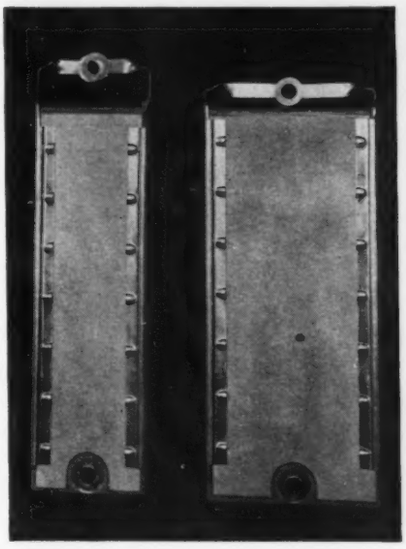


Fig. 1—Copper oxide rectifiers in plate form

The smaller of the two plates is 3 x 10 in. and has the same rectifying area as 42 standard 1½-in. disks. The larger is 4 13/32 x 10 in. and has an area equivalent to 65 disks. A still larger one (not shown) is 4 13/32 x 12 in. and equals 77 disks. Current collection from the sprayed metal surface is accomplished by the spring clip connectors, which also furnish an external terminal connection and at the same time a mounting support.

16. Operates without radio interference.
17. Life indefinitely long.

In consequence of these attributes the field of the plate and disk rectifiers now embraces the following potential applications for which they have peculiar appropriateness:

1. Electroplating.
2. Electrolytic cleaning.
3. Electrolytic cell supply.
4. All types of welding.
5. Motion picture projections arc supply.
6. Industrial truck battery charging.
7. Railway battery charging.
8. Electrolysis mitigation.
9. Field excitation.
10. Field discharge valves.
11. Low voltage, high current electromagnetic loads.
12. Filament supplies.

Characteristics alike

Natural limits in physical size of individual plates exist due to processing, handling and to the current collection from the sprayed metal coating itself. The expansion in physical size is shown in Fig. 1. Since both sides of the plates are oxidized and utilized, the actual gain in area is twice the apparent gain.

While the form appears new, in applying the plate rectifiers it must

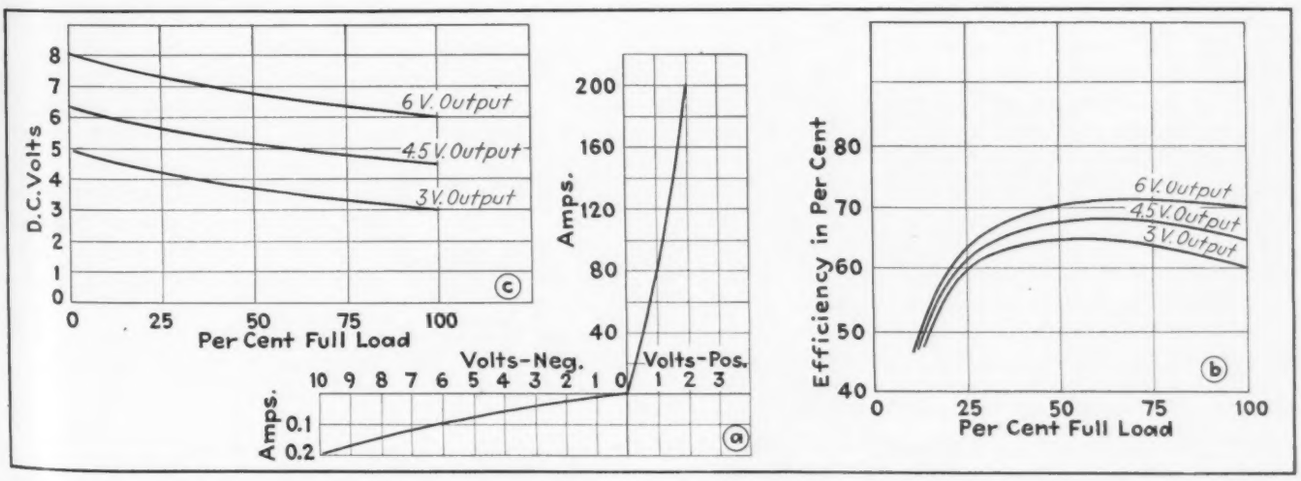


Fig. 2—Characteristics of plate rectifiers

(a) Volt-ampere characteristic of 3 x 10-in. plate. (b) Efficiency for various voltage outputs. As output voltage increases (up to maximum rating) efficiency is maintained over a wide range of load, practically from one-fourth to full load. (c) Voltage regulation also improves with increase in output voltage. This is a natural consequence of the forward voltage drop within the plate being the same regardless of output voltage.

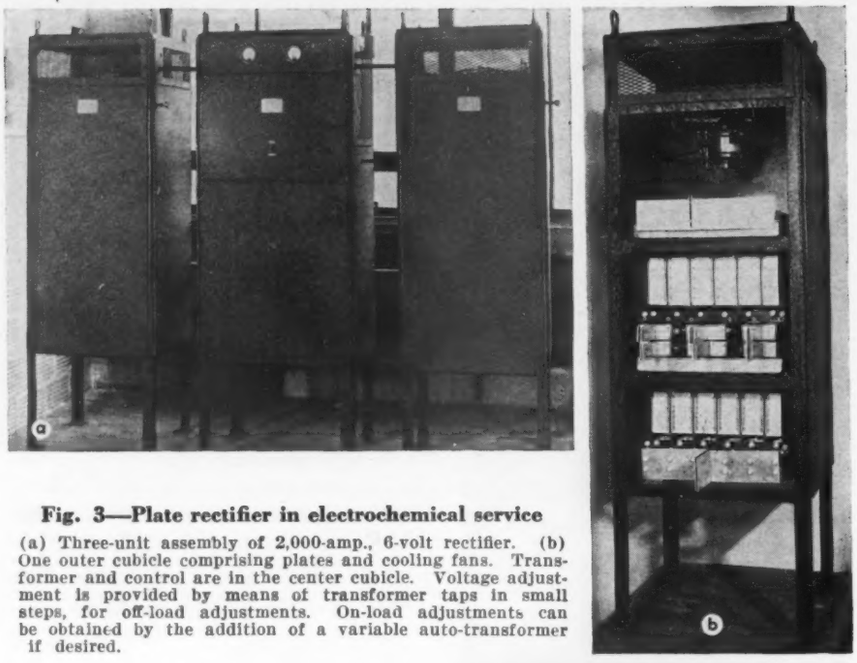


Fig. 3—Plate rectifier in electrochemical service

(a) Three-unit assembly of 2,000-amp., 6-volt rectifier. (b) One outer cubicle comprising plates and cooling fans. Transformer and control are in the center cubicle. Voltage adjustment is provided by means of transformer taps in small steps, for off-load adjustments. On-load adjustments can be obtained by the addition of a variable auto-transformer if desired.

be remembered that it is fundamentally a copper oxide rectifier and therefore has the same basic characteristics as the older disk type. So the plate rectifier is still a resistance device. For various voltages applied to a plate corresponding currents (Fig. 2) will flow, their magnitude depending on the polarity of the voltage.

Ratings depend upon operating temperature, thus on internal losses. So, for a given set of conditions, any plate will have a maximum rating for continuous output which should not be exceeded.

Since ratings are tied up with heating, for intermittent or short time duty outputs can be increased materially over the continuous rating without any damage to the rectifying element.

Since losses are resistance losses, efficiency will, generally speaking, be greatest at the maximum voltage rating of the plate. It will be the same for all multiples of this voltage, since any multiple will require the same multiple of plates in series. From this comes the statement that the copper oxide rectifier has the same efficiency at all voltages, which is evidently true with the above limitations. In other words, there is no gain in efficiency by operating at 120 volts d.c. instead of at 6 volts, as there would be in the case of a hot cathode or arc type of rectifier. These, having a constant internal voltage drop, naturally become more efficient as the output voltage is raised.

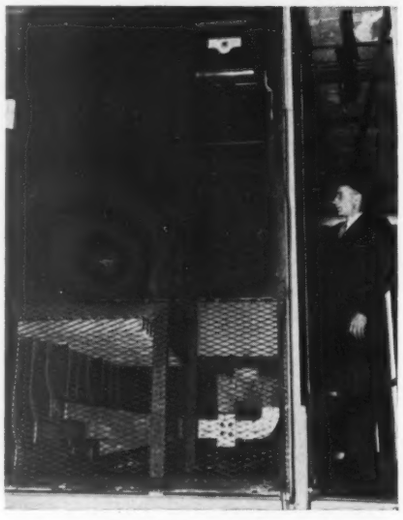


Fig. 4—Electroplating in industrial plant done with this 3,000-amp., 6-volt plate rectifier

Again, being a resistance device, the plate type rectifier has practically unity power factor. Furthermore, it creates no radio interference whatever.

Being electronic in action, there is no time lag in operation, but the rectifier delivers a d.c. output of full value immediately upon the application of a.c. voltage. This is an important characteristic on intermittent loads, since the rectifier can be energized from the a.c. side, thus eliminating all no-load losses during off-duty cycles.

The resistance characteristics mean that plates can be connected in series or parallel to any desired extent. They will divide voltage according to their resistance and pass current inversely as their resistance.

Finally, since the plate is fundamentally the same as the disk, the same performance as to life may be expected. This, as is well known by now, is indefinitely long; in fact, so far as laboratory life tests show, there is no indication as yet, after twelve years, that the copper oxide rectifier has any definite limitations to its life expectancy.

Plate rectifier applications

Naturally, applications will first be found in low-voltage, high-current fields, where the plate rectifier can still operate at high efficiency, while other forms of conversion are handicapped. Most prominent of these is the electrochemical field, where the rectifier may find use in plating, cleaning and processing. The first major installation in this country, which has now been in operation for eighteen months, was a 2,000-amp., 6-volt rectifier (Fig. 3a). The three-unit assembly contains rectifier plates and fans in the two outer cubicles, one of which is shown in Fig. 3b.

Advantages of such an installation are evident. No special foundation was required, the rectifier simply being set down on the factory floor just outside the plating room. Since this rectifier was started up the customer has not had a cent's worth of repairs to make, nor any parts to replace. No maintenance has ever been necessary beyond infrequent lubrication of the fan motors. Complete safety to workers is provided easily by interlocking the cabinet doors so as to cut off power when the doors are opened. Push-button control, which could be remote if desired, makes it easy to shut off the rectifier between loadings, thus saving power. Voltage adjustments by transformer taps instead of tank rheostats means efficient operation for all types of plating. Output wave form, being three phase, full wave, contains relatively little a.c. ripple voltage and gives excellent plating results.

The largest installation yet made, which is also in electroplating service, is shown in Fig. 4. This rectifier has a full load rating of 3,000 amp., 6 volts, d.c.

A kindred application, though in the field of cleaning rather than plating, is served by two smaller rectifiers rated at 200-amp., 4-volt output each. They are used in a major movie

[*Continued on page 116*]

Line Truck Body Weight Cut 35 per Cent

By FRED S. BEACH, Sr.
Designing Engineer, Northwestern Electric Company

AN ULTRA light-weight line truck body, fabricated from high-strength steel and assembled by welding, has been successfully developed in Portland, Ore., by the engineering department of Northwestern Electric Company. This body, together with lighter-weight fixed equipment, is combined into a unit which lacks nothing in sturdiness and convenience. Furthermore, it was constructed at a decided saving in cost.

In the past wooden composite or fabricated-steel-riveted bodies have been the rule. The new design was achieved by discarding preconceptions and proceeding with the same contempt for redundant weight that has led to such spectacular success in the construction of metal airplanes and light-weight trains.

The design was carried out on two chasses, one a DS40 International Harvester Company, one a GMC, both similar in all respects, with 2- and 3-ton nominal rating and 15,000-lb. gross loaded weight, including chassis body and equipment, gas, oil and water.

By careful study of many recently developed line trucks it was found that apparently no designers had taken full advantage of the possibilities of weight reduction in the use of steel as a construction material.

The prevailing practice of using longitudinal sills resting on the chassis frame to form an independent body frame is a contributing cause for excess weight in truck bodies and altogether unnecessary. This type of construction design was discarded in favor of making the bins and body-stake structures the longitudinal strength members and of placing the body cross-members directly on the chassis frame.

Many body designers and most builders cling to a belief that for body underframe construction, where steel is used, rolled shapes are more economical, because of their availability, and neglect to investigate the possibilities of weight saving by using sheet steel formed into suitable substitute shapes. In a structural sense the bevel of an I-beam or that of a channel has no value and is surplus metal put there only for practical reasons, which apply to rolling the sections at the mills.

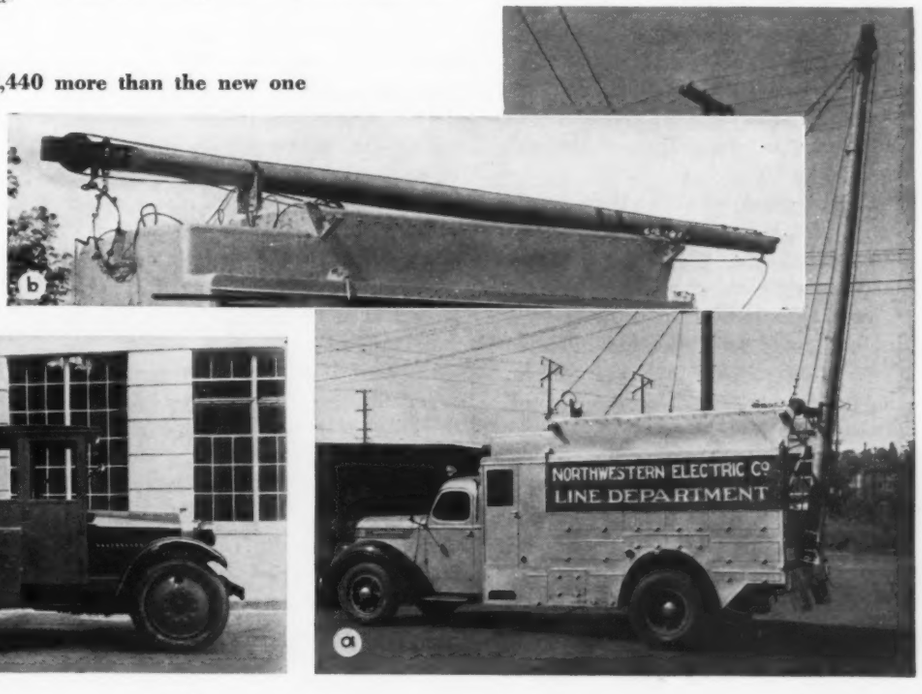
One-third weight reduction

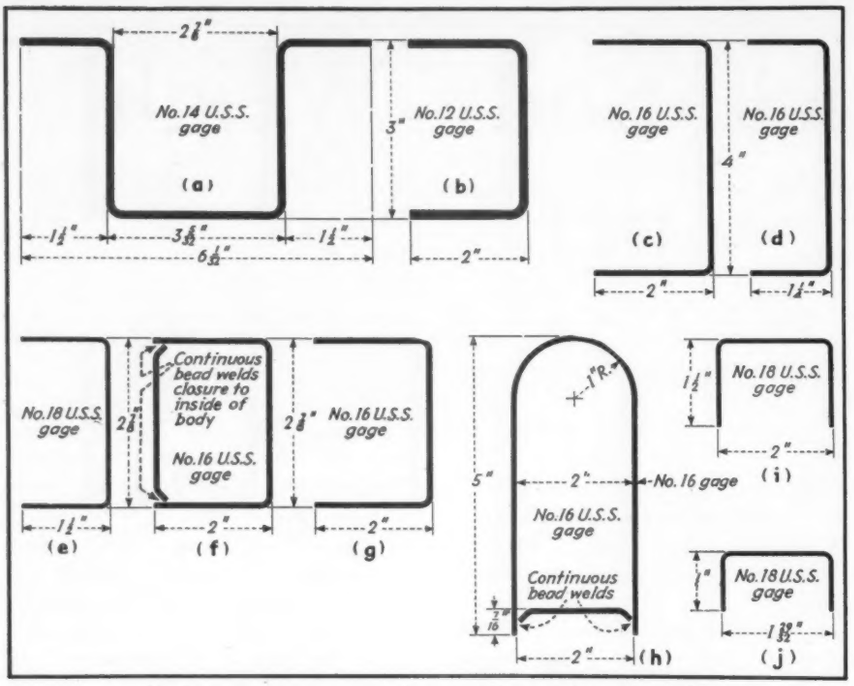
In the studies preceding the design of this unit's steel body a comparison of materials was made. It was found that if ordinary or "common" open-hearth sheet-steel was to be used in building a body of this kind the weight would be between 2,500 and 3,000 lb. By considering the new "high steels" and making comparative weight estimates based on the use of "Cor-Ten" (a product

* The design won a principal award in the James F. Lincoln Arc Welding Foundation competition.

The old truck cost $2,440 more than the new one

The new unit (a and b) replaces a unit developed in 1928 (c). It weighed 11,000 lb. empty, whereas the new one weighs 9,000 lb. The old truck had a 2-ton nominal capacity, was rated to load to 13,500 lb. gross weight. The new truck rates at 2 to 3 tons nominal and loads to 15,000 lb. gross.





Body depends on ruggedness of bin and inside stake for longitudinal rigidity and strength

This eliminates the use of longitudinal body sills. The cross-members (a) tie the side longitudinal structures together and carry them on their cantilevered ends. Body load plus distributed load on the loading-space floor are transmitted to the truck-frame long sills. (b) shows the section of the rear-body cross-member. (c) and (d) show the cab cross-members. Cross-members in the loading space are welded to the body stakes of both inner and outer systems at their lower ends.

Bin bottoms are formed of No. 16 gage "Cor-Ten" and are welded to the cantilever ends of the cross-members by continuous bead welds. The outer system of body stakes are No. 18 gage, formed "Cor-Ten" channels (e) and the inner-stake systems are No. 16 gage. The four inside body corner stakes are of box section (f). Intermediate inner stakes are No. 16 gage open channels (g). Stake rail is also a box section (h). Corner stakes are braced by diagonal channel braces formed of No. 18 gage "Cor-Ten" and these braces in turn are stiffened by struts of No. 18 gage formed "Cor-Ten" (i and j).

of the U. S. Steel Corporation) it was found that the almost double strength of the latter made possible the use of sheets two to three gages thinner. Estimates on this basis indicated a weight range between 1,800 and 2,000 lb. for the body and resulted in an actual weight reduction of 35 per cent. "Cor-Ten" also has a chemical structure which increases resistance to deterioration through rust and corrosion.

Combination of our light-weight body and equipment, which constitutes the dead load, with a rational loading schedule for the live load showed that 15,000 lb. would be the logical gross weight. This afforded two savings: First, 25.6 per cent in the purchase of the chassis; second, 60 per cent in license fees in Washington state, where the first unit is operating.

If ten years is assumed to be the practical useful life of the unit and 6 per cent to be the interest rate a gross of $1,400 would be saved.

Necessity for keeping weights at minimum was imposed by exactions of the Washington State Highway Department. No potential weight reduction was overlooked, no matter how small. Weights determined by scale weighing as the work advanced are given in the accompanying table.

At 9,000 lb. total empty weight the unit is licensed for 15,000 lb. gross, and the 6,000-lb. capacity does not exceed manufacturer's nominal rating. On its first service loading the truck scaled 12,000 lb., excluding crew.

Body

Both bodies, constructed by the New Haven Carriage & Auto Works, Portland, Ore., were constructed mainly of steel, all of it fabricated from flat-sheet "Cor-Ten." No bar stock or structural shapes were used. Structural members were formed from Nos. 10, 12, 14, 16 and 18 gages. Bin and curtain walls and flat surface members were fabricated from sheets ranging from Nos. 18 to 24 gage inclusive.

The cab space occupies 37 in. of the body length and its full width. It is fitted with seat and lazy-back cushions and, for safety, has entrance doors both right and left. Six to eight men can be comfortably accommodated in the two cabs—three, including the driver, in the driver's cab and four or five in the body cab. Thus none of a normal crew, up to eight men, needs ride in the rear.

Under the cab seat is mounted the winch, with the seat riser and division bulkhead between cab and loading space forming its cover. Seat and lazy-back cushions are in three sections, one of each over the winch drum being quickly removable to enable the driver to observe winch operations and signals.

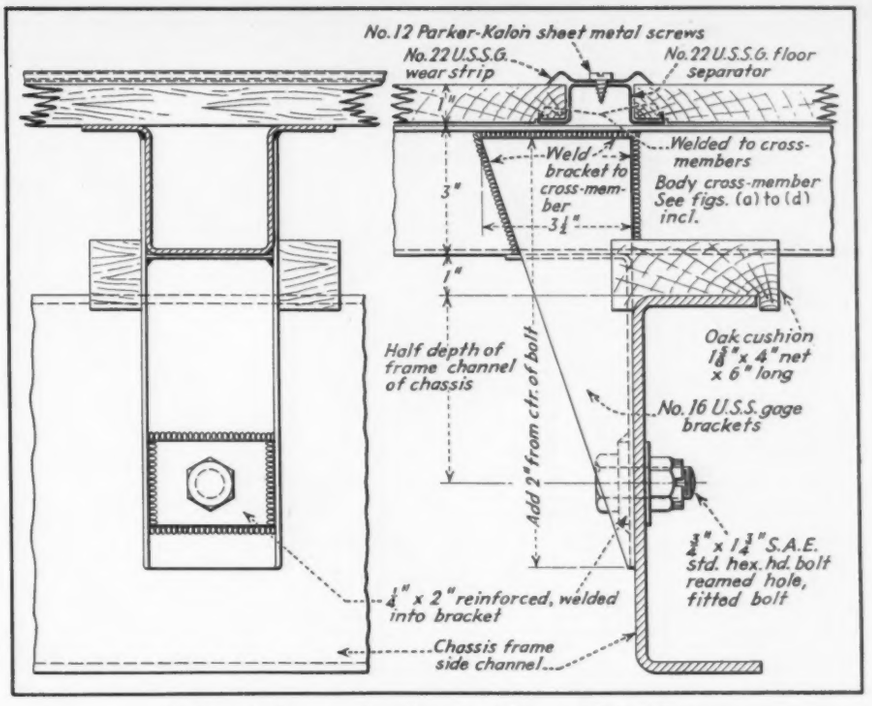
Along each side of the body, back of the cab, are ten material and tool-bins with top-hinged doors made of 12-gage, 17ST, high-strength aluminum. Doors are fastened at their bottom edges with pressed-steel sash locks, such as are commonly used for fastening double-hung window sashes. There are three narrow doors at the floor line on each side. These cover three shallow drawers extending across the body so that they can be pulled out from either side. Under the cab space, back of the cab-step recess, on each side of the body is a door which gives access to compartments below the cab floor and winch-drum shaft-extension brackets. This compartment, on the right-hand side, carries the demountable niggerhead. The two others are for hand saws, chisels, rock-drill bits, augers, boring bits, etc. One of these can be adapted to carrying rubber line hose for hot line work. They are 2½ in. deep, made with plywood bottoms, and slide below the body floor and side bins and over the top of the truck-frame sills.

Above the bins are racks formed by the outside and inside body stakes or posts and divided by horizontal struts into two spaces, one above the other. The lower spaces are intended for and will accommodate four 3¾ x 5¾-in. cross-section or eight of 3½ x 4¼-in. cross-sections. The upper spaces are intended for digging tools. A metal roof covers these racks. Above this roof the body narrows to the inner line of body stakes, along the tops of which are rails joining the system rigidly integral with the roof.

Formed of the same sheet is a panel which extends upward from the roof to the top of the stake rail.

This narrowed-in section is the same width as the cab clerestory and provides storage for the extension ladder on the left and for hot-line tool compartment and pike racks and boot on the right. Inside the top stake rails are pockets which receive the top bows supporting the canvas roof over the loading section. At the back end of the stake rail and bracketed out from the rear inside stakes are the shaft supports. These are split, and a hinged cap, which has a split lug, permits clamping the shaft with a fixed stud and nut. The spindle shaft is Shelby seamless-steel tubing $2\frac{3}{4}$-in. diameter with $\frac{3}{8}$-in. wall. This is about half the weight of the $2\frac{7}{16}$-in. solid shaft formerly used and has greater strength.

Along the inside below the top bow pockets are pipe rails which support the hooks for carrying rigging rope and block tackle. There are nine of these to a side, arranged to slide along the pipe rail. At the rear, extending across the body and 10 in. below the floor line, is a heavy cross-member tapered up to 5 in. at the ends from a straight section of full depth 34 in. wide. This member is a combination kick plate, for the back edge of the loading floor, and body-end stiffening member. At each end of it is an anchorage for the stiff legs. Two fixed steps are provided for getting into the loading space, two loops are provided for safety chains for trailers and a double-acting drawbar tow coupling is provided for trailer hitch. The two lugs at the center above the tow coupler are for pinning in the pole derrick gin pole when stepped in for raising poles.


No. 12 Parker-Kalon sheet metal screws
No. 22 U.S.S.G. wear strip
No. 22 U.S.S.G. floor separator
1"
Weld bracket to cross-member
Welded to cross-members
Body cross-member See figs. (a) to (d) incl.
3"
3¼"
1"
Half depth of frame channel of chassis
Add 2" from ctr. of bolt
Oak cushion 1⅜" x 4" net x 6" long
No. 16 U.S.S. gage brackets
¾" x 14¾" S.A.E. std. hex. hd. bolt reamed hole, fitted bolt
¼" x 2" reinforced, welded into bracket
Chassis frame side channel

Body attaches to the chassis with special brackets

The bolt holes in chassis-frame sills were all located in the neutral axis of the sill cross-section.

Winch

Developed and manufactured by Ramsey Machinery Company, Portland, Ore., the winch has a rated capacity of 10,000 lb. on a single line at the first wrap on the drum. The drum is 6 in. in diameter at the barrel, with $10\frac{1}{2}$ in. between flanges. Flanges are of sufficient diameter to give a drum capacity of 400 ft. of $\frac{1}{2}$-in. six-strand wire rope. With a full drum, winch capacity is 4,000 lb.

In certain features this winch is special, since the drum shaft is extended both ways from the winch drum to accommodate the special outboard niggerhead which is mounted for use outside the body.

Outboard extension brackets carry a self-aligning bearing for the shaft extensions, which are made of $1\frac{3}{4}$-in. diameter Shelby seamless-steel tubing with $\frac{1}{2}$-in. wall. These extensions are joined to the $1\frac{15}{16}$-in. drum shaft with Link Belt Company's standard roller-chain-type flexible couplings. The combination enables the winch to accommodate itself to distortions caused by the flexing of the chassis frame when the truck is on unusually uneven ground.

Radical departure from the conventional is the friction clutch. On the winch itself, the motion to operate the drum is transmitted from the drum shaft through a 4-1 ratio sun and planet gear system. The sun pinion is keyed to the drum shaft. The planet pinions are mounted on studs carried on a brake disk which revolves freely on an extended sleeve formed on one end of one of the drum shaft bearings when the drum is disengaged.

These planet idler gears also mesh with an internal gear which is on the inside of the brake flange of the drum. When the idler disk is stopped and held by the band brake the planet idler gears and the drum internal gear turn the winch drum. A ratchet and pawl are provided for holding loads suspended, the pawl being engaged or disengaged at the will of the operator. All controls for the winch are installed in the driver's cab.

Pole derrick

The pole derrick is a simple gin pole suitably guyed. Only two men are needed to make it ready for pole setting and there is no lifting to do. It is anchored to the spindle shaft and carried by the shaft when not set up. When in its prone traveling position the upper end is carried in

[*Continued on page 114*]

Progressive Weight Analysis

	Total Weight	On Front Axle	On Rear Axle	Est. Total
Chassis with standard rear axle	5,670	3,100	2,570	5,821
Chassis with dual range rear axle	5,770	3,100	2,670	5,821
Chassis with dual range rear axle and installed winch	6,280	3,350	2,930	6,356
Chassis as above, body added inclusive of tow coupler chassis reinforcement, and stiff legs less pole derrick	8,350	3,600	4,750	8,156
Chassis as above with pole derrick	9,060	3,770	5,290	8,356

The 2,780-lb. difference between the fifth and third weighings represents the following components:

Body	1,958 lb.	Derrick and guying	510
Coupler plus reinforcing	47½	Canvas roof and side curtains, lazy-back, spotlights, etc	200
Stiff legs	48		
Snatch-block eyebolt	16½		2,780 lb.

Editorials

S. B. WILLIAMS, Editor

Why Doesn't the President Say Something?

THE President's National Defense Power Committee has proudly announced the completion of the first step in its program as the result of commitments by leading public utilities to place orders immediately for one million kilowatts of generating equipment. The President, however, has remained silent and people are asking why.

This announcement was taken as a signal to revive again the talk about expenditures by utilities running into billions. A million kilowatts of generating capacity, even if it involved all new transmission and distribution, still would not equal a billion dollars. The total investment of the utility industry is 13 billions and the installed generating capacity of all kinds is 35 millions. On that basis, one million kilowatts would at the outside require between 350 and 400 millions. But this new capacity, according to the committee's announcement, is to replace older and less efficient plants, which will be held for reserves.

A million kilowatts of steam capacity is about 20 per cent more than was installed in 1937, but about 35 per cent less than was scheduled at the beginning of the year for completion in 1938. This new capacity in all probability would have found its way into equipment production before long, so that the utilities have very definitely co-operated with the government by advancing their construction schedules.

What have they received in return? This is not an academic question. It is being asked by the public. The President could clear this up quickly by a simple, straightforward statement.

People seem to feel, and they are far from being wrong, that a utility industry unhandicapped by fear of government attack could by its purchases go a long way toward leading this country out of its business difficulties. Equipment for this million kilowatts of generating capacity is but a fraction of what the industry requires and will order when it can finance the expenditure properly.

The RFC, it has been intimated, will make loans available to the utilities "in appropriate cases." That isn't what is wanted or needed. While the recent bond flotation has been for refunding purposes, the price is sufficient indication that mortgage money will not be expensive or difficult to get. What the utilities need to engage in large capital expenditures is to be able to sell stock.

Under the song of peace that has been playing on our ears ever since the President's committee was appointed in September, the prices of utility stocks have advanced. Speculation or not, the indications are that people will invest in utility stocks upon encouraging news. This whole thing could be hastened by a word from the President.

We stand today at the beginning of a new era of utility buying, some for expansion and considerable for rehabilitation. It will have a great value in improving national defense power reliability, but it will be worth much more in providing work for thousands of men and women. The utilities are eager to go ahead if only they could see their way clearly. The utilities have shown their willingness to co-operate.

Why doesn't the President speak?

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Utility Proposal for Code Revisions

THE proposals of the light and power group before the Electrical Committee, N.F.P.A., for revision in the National Electrical Code were received at the several sectional meetings of the electrical inspectors with remarkable restraint, considering the scope of the suggested changes. The most frequently heard complain from the inspectors was that they were not taken into the utilities' confidence as to the nature and reasons for the proposals.

If there is any justification for this criticism there is still time for representatives of the two groups of the industry to meet and discuss the merits of the suggested changes. The inspectors will find that the utilities are equally desirous of securing safe wiring. They may not agree as to what constitutes minimum safety, in which case we would have a situation that calls for study and facts and not argument.

To characterize the utilities' proposals as a reversion to shoddy, substandard materials, as does the I.B.E.W. in its October *Journal*, is contrary to fact. To say that the proposals will reduce employment is equally erroneous.

The aim of the utilities as expressed by President C. W. Kellogg in ELECTRICAL WORLD is to hasten adequate wiring. If these proposals will so reduce unit costs as to encourage more wiring, it should be obvious that there will be more business for all.

The utilities may find that some of these proposals are going to be difficult to justify. On the other hand, the proposals were sincerely made and should be sincerely received for discussion by the other branches of the industry.

If some mistakes have been made in approach, there is still time to correct that. It is unfortunate that

proposals for major revisions of the Code have at times brought such serious differences of opinion as to create suspicion of motive. There should be no occasion for such a situation to develop at this time and it is sincerely hoped that all interests can by conference come to a mutually agreeable solution and thereby establish a new precedent for Code revision procedure.

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C.R.E.A. Merits Continued Support

FIFTEEN YEARS ago the goal of a million farms connected to electric service lines seemed fantastic enough to be the kind of impossible ideal that promotional groups like to set up for themselves. The theory is that more is accomplished by striving toward large objectives, even though never attained, than by the easy achievement of smaller aims. Thus it was with the Committee on the Relation of Electricity to Agriculture back in 1923, when Arthur Huntington, J. C. Martin, G. C. Neff and others started the organization.

Several years back the committee saw realized its aim of service to a million farms. Today farms connected and to which service is available mount to a total well on the way to the two million mark. And now the committee has changed its objective. Appreciating that the mere number of farms connected is not a measure of the national usefulness of electricity applied to agriculture, the committee has set another goal—a million farms completely electrified.

It would be claiming too much to say that entire credit for the progress of farm electrification so far in this country belongs to C.R.E.A. But it is not too much to say that more of the credit should go to C.R.E.A. than to any other single agency. Quietly, competently, under the able direction of E. A. White, C.R.E.A. has collected, collated and analyzed farm electrification data and made that information available to all who could use it. The work has not been spectacular, has not made headlines. For the finding and dissemination of facts essential to progress are all too frequently prosaic.

The new aim of C.R.E.A., a million farms completely electrified, will require continuance of exactly the same kind of work in which the committee is already distinguished. The economics and engineering of farm electric service must be studied in all their aspects of energy supply and use. Information from all possible sources must be brought together, analyzed, co-ordinated and presented in form usable by makers of farm service equipment, by energy supply organizations, by dealers and salesmen, and, most important, by farmers themselves. Not otherwise than by the painstaking collection and the intelligent use of facts can rural electrification be made to mean what it should—profitable employment of electricity as an essential tool of American agriculture, not simply the building of more thousands of miles of line of which the economic value is questionable, to say the least.

To continue in the necessary work that has been so resultful, to expand that work in consonance with the need and the opportunities for it, C.R.E.A. requires and should have the wholehearted support of those who will benefit. Foremost among these is the electrical industry. Next come the makers of and dealers in farm equipment. Third are the farmers as represented by their organizations. Making farm electric service profitable to all concerned, only thus justifying it as an element in American business, is a job that must be done if rural electrification is to be prevented from degenerating completely into an affair of politics, wasteful, inefficient and unsatisfactory to all.

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Responsibility for Guiding Public Opinion

URGING positive co-operation with the congressional monopoly investigating committee, Thomas I. Parkinson, president of the Equitable Life Assurance Society, at a meeting a few days ago of the Chamber of Commerce of New York, said:

> *"Are we afraid that positive action in the direction of guiding public opinion in this field may be termed political? As for me, I would rather give up my position in the business world, which I am very proud of, than give up my right to contribute to the decision of my fellow citizens as to what is good for the public welfare of this country."*

Fear, more than anything else, has kept the utilities from becoming more active in guiding public opinion. This fear, which has not been altogether groundless, has in some instances gone too far. It is just as bad to lean too far over backward as it is to be too aggressive in propaganda.

Guiding public opinion need not be political. It can be confined to proven facts and parallels. It would not be necessary to engage in public education if men in public life fairly represented the people. Where they are unbiased and ruthless with respect to the rights of others, no matter how high an office they might hold, it is unpatriotic to permit their words and actions to go unchallenged with facts. After all, the United States is not the legislators and administrators, elected or appointed, but rather the people themselves. The unpatriotic thing is to permit the people to take an action that business knows will be ruinous in the long run without giving the public an opportunity to hear both sides of the story.

Guiding public opinion is a part of a public relations program. Some suggestions for such guidance were given in the Public Relations Section of ELECTRICAL WORLD for October 8. Reprints of this 24-page section are available at nominal cost for further distribution.

A Different Congress

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

THE next Congress, which will be elected November 8, to be in power for the next two years, will be much less responsive to President Roosevelt's desires for competition by the government with private business. There will be far less tendency for a sevenfold repetition of the TVA, for 45 per cent free grants out of the federal treasury for electric plants to compete with or supplant privately owned plants.

This is not an election forecast. It will be true no matter what the outcome of the November elections. Most of the important decisions were made in the primaries. Election results will merely fill out the picture.

This does not by any means prove that the new Congress will be conservative. In some respects it may be more radical than the present Congress, or the two preceding under which most of the so-called New Deal legislation was enacted. But the radicalness of the new Congress will be of a different type. It will be a radicalness due to the tremendous popular favor which the Townsend plan, the $30 every Thursday plan. and like schemes for the benefit of the aged, have shown in primary after primary.

Political aspect of power

In no single primary contest of outstanding importance has the New Deal policy toward the electrical industry, the idea of having the government go into competition with private capital, been the issue of the winners. Quite the contrary. In almost every single instance when a sitting member of the House or Senate was attacked as the friend of the "power trust" that sitting member has won, and won handsomely. Notably in the case of Senator Walter F. George, in Georgia, who was attacked bitterly, not only by the New Deal candidate against him, but by former Governor Eugene Talmadge, who was the runner-up in the primary contest, as the "tool of the power trust." George won not only by a tremendous popular majority, but obtained a clear majority of the county unit votes. In Maryland, where Senator Millard F. Tydings was attacked on the same issue, his vote against the "death sentence" being used constantly by his New Deal opponent, David J. Lewis, the popular and county majorities were also impressive. The power issue also played a big part in the South Carolina primary.

It is worthy of note that these senators, against whom President Roosevelt personally intervened, all voted against ratification of the St. Lawrence seaway pact. They did not so vote because of the power angle, but because of the fear that the seaway would deprive the ports of their respective states and the railroads serving them of tonnage. But the President's particular bitterness against them, far exceeding his bitterness against the six other Democratic senators who had opposed him on the Supreme Court issue, was due in part at least to his resentment on the St. Lawrence issue.

For it must be borne in mind that Mr. Roosevelt almost never gives up an issue in which he is really interested. He comes back again and again. He has come back on the St. Lawrence issue, in an appeal to the people of Canada in recent speeches. No one doubts he will force the government reorganization fight early in the new Congress.

In this contention that the new Congress will be more conservative on the power issue is no thought of any sweeping Republican gains. These will not be striking. Every observer agrees that the Republicans have not a Chinaman's chance of winning control of either House or Senate, though likewise agreeing that the G.O.P. will make gains in both House and Senate. The best guess seems to be that the Republicans will gain a minimum of 50 seats in the House, which may swell to 70, and will gain from five to seven seats in the Senate.

It so happens, however, that most of the Democrats in danger of being replaced by Republicans in the election are hundred per cent New Dealers. There are a few exceptions, such as Senator Guy Gillette in Iowa, who is in danger of being defeated by former Senator Lester J. Dickinson, regarded as perhaps the most conservative of all the Republican candidates running in doubtful states.

But contrast this with the fact that Senator Fred H. Brown of New Hampshire, one of the most enthusiastic utility baiters on Capitol Hill, is almost sure to be defeated. Then in Ohio Senator Robert J. Bulkley, a "me too" Democrat on most issues, seems likely to be defeated by Robert A. Taft. In Illinois the President suffers his greatest loss whatever the outcome of the election. Senator William H. Dieterich was probably the No. 1 boy when it came to following every presidential whim in the entire upper house. He was not even able to get organization support in the primary. Scott W. Lucas, who won the Democratic primary, opposed the President on the Supreme Court issue and was against the White House on reorganization. Yet even Lucas may be defeated by a Republican still stronger against government entering into competition with private business.

Political freedom

South Dakota will also send a far less enthusiastic New Dealer to the Senate in place of Herbert E. Hitchcock, whether the winner next Tuesday be a Democrat or Republican.

Word from California is that a conservative Republican may defeat Sheridan Downey, who is a New Dealer, he says, save for his advocacy of the $30 every Thursday idea. But even Downey would not be a better New Dealer on the public ownership issue than Senator William Gibbs McAdoo has proved.

[*Continued on page 104*]

News OF THE WEEK

Utilities Expand Plant Capacity to Strengthen Nation's Defense

Leading companies make definite commitments to add 1,000,000 kilowatts of equipment as part of program of President Roosevelt's national defense group — Praise co-operation in working out plan

Definite commitments on the part of leading utility companies of the country to place immediate orders for turbo-generators, boilers and auxiliary equipment totaling 1,000,000 kw. of generating capacity were announced last week by Louis Johnson, Assistant Secretary of War and chairman of President Roosevelt's National Defense Power Committee.

Mr. Johnson said that this move is a long step in bringing the equipment of the utility companies up to peace-time requirements when installed and will place the country in a position to meet power requirments in time of war.

Industrial areas named

The utilities where additional capacity will be installed are located in the industrial areas where production of munitions and other war materials would be great. Some of them are: Baltimore - Washington, Birmingham, Boston, Bridgeport, Buffalo - Niagara Falls, Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Pittsburgh, Rochester, St. Louis and Schenectady.

Mr. Johnson stated that it is understood that statutes already in effect would permit government agencies to give assistance, if necessary, to financing the national defense program for electric power expansion in appropriate areas. In this connection the RFC would make loans to the utility companies.

Commonwealth Edison of Chicago is making plans to erect and place in service 100,000 kw. of additional generating capacity by the end of 1940. Cost of the expansion program is expected to be about $25,000,000. Engineers of the company for several weeks have been working on plans for the additional plant capacity and construction will be started as soon as their report is ready.

Sees move constructive

C. E. Groesbeck, chairman of Electric Bond & Share, in discussing the additional power facilities, stated that "I regard this as a highly constructive move of great national significance not only as implementing the defense program of the federal government but as to its bearing on the question of re-employment and the revival of business and industry throughout the country. I believe it affords the opportunity of re-opening the capital markets, particularly for equity financing, to the utilities."

Mr. Groesbeck said that "this is an excellent demonstration of what can be accomplished for the good of the country when business and government sit across the table in a spirit of co-operation. Naturally I am gratified at the outcome of the meeting."

Floyd L. Carlisle, chairman of Consolidated Edison Company of New York, Inc., and Niagara Hudson Power Corporation, estimated that the defense program will swell utility maintenance and construction expenditures to about $1,000,000,000 a year. Mr. Carlisle said that "substantial" government financing was involved in the proposed program, but said such assistance would not be in the form of grants and that the government would do "nothing more than lend money or buy securities in the same manner as a bank."

Mr. Johnson said that for war, or other emergency purposes, the government shall have first call upon the facilities of the industry, both public and private, and that in peace-time they will be co-ordinated for the purpose of making them quickly available in the event of war, or other emergencies. He said that new private plants, when constructed, will be operated as a part of the companies' systems, replacing older and less efficient plants, which will be held for reserves and emergencies.

It was emphasized by Mr. Johnson that while the commitments made by the utilities for the construction of these new power plants would increase generating capacity in the nation's strategic centers, and would place immediate production with the manufacturers of electric generating equipment to enable them to build and maintain vitally important staffs of skilled personnel, this constituted only the first step in the committee's program. He said that his committee is proceeding to elaborate plans for interconnections to remove "bottlenecks" in the supply of electricity and for the construction of a reserve of power generating capacity adequate to meet war or other special requirements.

Mr. Johnson said that he wanted to express, on behalf of his committee, appreciation of the prompt and wholehearted co-operation of the utilities and their engineering staffs which, during a little more than a month, thoroughly canvassed power requirements in the strategic war material centers and worked out the program.

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Clarksville Deal Confirmed

FPC has announced its authorization of the sale by Kentucky-Tennessee Light & Power Company of certain properties located in Clarksville, Tenn., and vicinity to the city of Clarksville for the sum of $260,000 cash, in accordance with an agreement dated September 12, 1938, between the Kentucky-Tennessee company, the city of Clarksville and the Tennessee Valley Authority, which will supply power to Clarksville through the newly purchased facilities.

Chicago Utility Makes Change in Allowances

Commonwealth Edison Company has announced, effective as of November 1, a revised schedule of allowances to contractors for installation of electric ranges and water heaters. The new schedule is more generous than the superseded one.

Instead of flat allowances for range installation of $35 plus $12 for moving the meter outdoors when necessary, making a total of $47, the same total is reached by allowing $25 for the range installation, $10 for increased service wiring capacity and $12 for meter moving. If the meter has previously been moved outdoors the service wiring capacity allowance is raised to $15.

Other changes in range allowances to fit conditions of multiple dwellings are also made and the net result of all changes is that the contractor may collect slightly more or less than previously, but with better assurance that a given allowance more nearly fits the particular case. The water heater allowance is raised from $35 to $43 and this, in connection with the revised allowances for increased service capacity and for meter moving, constitutes a much more generous recognition of the contractor's cost.

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Associated to File Plan of Integration

Hope that a "calmer public attitude" is now developing which will enable utilities to expand their operations is expressed in the 1937 annual report of the Associated Gas & Electric Corporation, signed by J. I. Mange, president.

A committee has been appointed to prepare a tentative plan of integration and simplification looking toward compliance with Section 11 of the Holding Company Act, for submission to the Securities and Exchange Commission. During the past year eight companies have been eliminated, according to the report, which also states that the properties in New York, Pennsylvania and New Jersey, where 65 per cent of the customers are concentrated, represent a closely integrated and interconnected group which would form a strong nucleus of properties even in case it becomes necessary to dispose of the more distant holdings.

"Uneconomic" rate reductions are criticized in the report, which defines them as those "which cut down net earnings to a point where investment in public utility equities is no longer attractive to those who have capital to invest." The report also sees "considerable evidence that this point now has been, or is just about to be, reached by the electric and gas industries."

Gross operating revenues totaled $128,597,793 in 1937, an increase of $8,151,568, or 7 per cent, over 1936. Operating expenses and maintenance rose to $66,282,572, an increase of $4,748,855, or about 8 per cent. Operating income was $35,573,479, a decrease of $568,030, or 1.5 per cent, from 1936. Taxes increased to $15,675,513 for the year, a rise of $2,644,638, or 20 per cent, largest ever recorded over a previous year.

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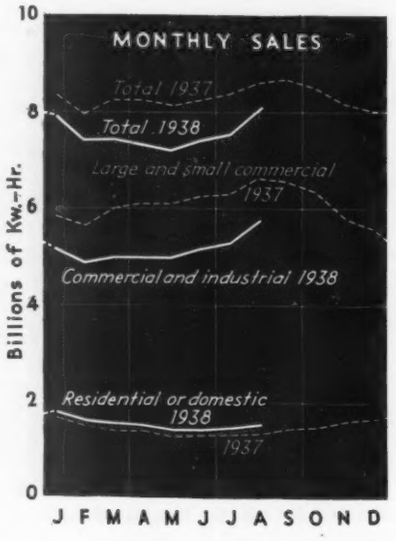
Industrial Energy Sales Still Rising



Confirming the rise previously indicated by the weekly figures, announcement of the production of 9,653,253,000 kw.-hr. during August, by the Edison Electric Institute, shows an increase of 6.8 per cent over July. The total input, including energy purchased from other sources, was 10,072,211,000 kw.-hr., which likewise was 6.8 per cent more than in July, but it was 4.6 per cent less than a year ago, compared with a disparity of 8.0 per cent in July, 8.7 per cent in June and 9.2 per cent in May.

Sales totaled 8,092,624,000 kw.-hr., or 7.0 per cent more than in July. The greatest increase was in the "commercial and industrial" group, which accounted for 5,773,021,000 kw.-hr., an increase of 9 per cent over July. Residential or domestic sales, 1,526,834,000 kw.-hr., were 10.2 per cent greater than a year ago.

Revenue from sales, excluding sales to other utilities, was $180,293,000; from other sources $2,087,000. A year ago revenue from ultimate consumers was $181,448,400. Classification was changed in 1938.

Utility Service Units to File SEC Reports

The SEC has taken the first step toward ultimate promulgation of regulatory rules for utility service companies and is mailing copies of forms to all registered holding companies. The rule becomes effective November 15.

The rule requires a report to be filed by any affiliate of a registered holding company or subsidiary which proposes to take any steps in the performance of any service for a company of which it is an affiliate. It also applies to any company whose principal business is the performance of services for registered holding companies or utility subsidiaries and which proposes to take steps in the performance of such services.

It was reported by the SEC that the report will contain routine information "which can be easily supplied by the service company and which will identify the company, its affiliations and client companies, and the general character of services rendered.

Provisions have been made for supplementary reports to be filed by the service companies so that the commission will have further information on certain phases of their operations.

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Utility Gives Up Promotion of Smaller Refrigerators

Following a recent survey, Consolidated Edison Company of New York, Inc., announced last week that its promotional efforts in the field of average apartment house and private residence refrigerator installations in its territory would be confined to automatic refrigerators of no less than 5 cu. ft. capacity.

In a letter to the refrigerator manufacturers whose models are displayed in the system's showrooms. E. F. Jeffe, vice-president in charge of sales, said the investigation had shown that automatic refrigerators under the 5 cu. ft. size would not satisfactorily meet present-day requirements for the average apartment house and private residence and that, therefore, the company had decided to discontinue promoting them.

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New Meters for Kansas City

Kansas City Power & Light Company plans to spend approximately $400,000 on meter installations, to be completed in the remaining three months. The new meters, which will register both demand and consumption, are to be used by some 12,000 business firms and small manufacturing concerns that fall under the commercial demand rate.

N.E.M.A. Budget to Include Wide Range of Sales Promotion Drives

Approval of 89 projects given during annual meeting in Chicago — Activities will aid utilities, distributors, dealers and department stores —Carl L. Peirce, Jr., succeeds D. Hayes Murphy as president

An intensified program of direct and indirect sales promotions was approved by the National Electrical Manufacturers Association last week in convention in Chicago as Carl L. Peirce, Jr., president of Hubbard & Company, was elected president of the association.

The budget passed at the policies division meeting included 89 projects proposed for 1939, including a wide range of sales promotion activities to aid utilities, appliance distributors, dealers and department stores.

List of activities

Direct sales promotion activities include the electric range, water heater, commercial electric cookery and kitchen modernization. Indirect sales promotions include residential adequate wiring, rural electrification, electric kitchen promotion, industrial electrification, street and highway lighting and institutional safety.

The electric roaster group will sponsor a national promotional campaign. Manufacturers of electric irons and table cookery equipment are developing a plan for selection of approved months when all will promote the same theme in their advertising.

In addition to approving the budget items, the association authorized a survey of sales possibilities in the manufacturing field. The results of this survey will be submitted at next year's convention and may form the basis for a promotion project similar to the adequate wiring program.

More than 650 members attended the annual convention, during which 147 meetings were held. Mr. Peirce succeeds D. Hayes Murphy, president of Wiremold Company, as president of N.E.M.A.

Officers elected for 1939 included Mr. Peirce, president; Matthew Porosky, Walter Robbins, Charles E. Swartzbaugh, N. G. Symonds and George C. Thomas, Jr., as vice-presidents, and Leonard Kebler, treasurer.

Members of the executive committee include H. B. Crouse, F. R. Fishback, F. C. Jones, F. W. Magin, D. G. Phelps, Matthew Porosky, Walter Robbins, R. J. Russell, E. O. Shreve, C. E. Swartzbaugh, N. G. Symonds, George C. Thomas, Jr., and D. Hayes Murphy.

The new members of the board of governors for a term of three years include Gerard Swope, president of General Electric; G. S. Crane, vice-president of Cutler-Hammer, Inc.; H. E. Blood, president of Norge division, Borg-Warner Corporation; J. S. Lawson, general manager of Memco Engineering & Manufacturing Company; F. R. Fishback, president of Electric Controller & Manufacturing Company; T. B. Hasler, president of Wilson Welder & Metals Company; C. L. Collens, president of Reliance Electric & Engineering Company; G. F. Elliott, chairman of Elliott Company; R. J. Russell, vice-president and secretary of Century Electric Company; Walter Robbins, chairman of General Cable Corporation; E. H. Hammond, vice-president of Kennecott Wire & Cable Company; W. E. Sprackling, vice-president of Anaconda Wire and Cable Company.

Members for a term of two years included Ralph Kelly, vice-president of Westinghouse Electric & Manufacturing Company, and A. L. Eustice, president of Economy Fuse & Manufacturing Company.

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Rural Power Groups Unite

Creation of an association of REA co-operatives has been announced in Lansing, Mich., with the submission of articles of incorporation to the Michigan Corporation and Securities Commission. Nine co-operatives in the state are listed as incorporators, while the five others are expected to join later. The nine claim a membership of 12,000, while a potential membership of 40,000 for all the units is claimed. Purposes of the association are declared to include a study of problems which face electric co-operatives, promotion of legislation in their behalf and promotion in general of rural electrification.

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New Sales Program Started By Rocky Mountain League

Approximately 10,000 persons and $100,000 will support the combined appliance and lamp sales program that will blanket the Rocky Mountain area between now and Christmas, according to George E. Lewis, manager, Rocky Mountain Electrical League.

As a prelude to the annual Christmas lighting activity sponsored by the league, the yearly Jubilee and Electrical Exposition will be held in Denver, December 1 to 3. This exposition will start a series of similar shows throughout the league's territory, sponsored by local leagues and utility companies, and showing newest developments in the lighting and appliance fields.

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Lynn Utility Repairs Wharf

Lynn Gas & Electric Company is completing repairs and improvements, at a cost of $1,000,000, to its wharf and equipment which were damaged to the extent of $750,000 by fire last spring. The equipment is in use for unloading coal vessels.

WINS AWARD—H. B. Crouse (left), president of Crouse-Hinds, presenting the James H. McGraw Award manufacturers' medal to George C. Thomas, Jr., vice-president and treasurer of Thomas & Betts, at the N.E.M.A. meeting in Chicago

STORE LIGHTING—Boston Edison's newest community shop in East Boston, with local manager offices and salesroom, has 26 semi-flush, 500-watt lighting units to diffuse high-intensity illumination throughout the merchandise display area

Board Permits Cut in Rural Charges

Michigan Public Utilities Commission has granted the Indiana-Michigan Electric Company, South Bend, Ind., and Benton Harbor, Mich., permission to reduce its charges for rural service and accepted for filing an agreement for the division of territory between the company, the Fruit Belt Electric Co-operative and the Van Buren Electric Co-operative.

Customers will guarantee for five years a monthly payment of 1½ per cent of the total construction cost of their power line, providing that where there are three or more customers to a mile the guarantee will not exceed $2.50 a customer. Under the former rate schedule there was no provision for the $2.50 maximum. The company said the reduction would affect 1,772 customers and would save them $4,558 annually. It said the reduction will affect customer contracts now in effect and as a result will save those customers $15,000 over the life of their present contracts.

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Connecticut Light & Power Has New Rural Power Rate

The Public Utility Commission has found, after a detailed survey of Connecticut's rural electrification problem, that there are 6,188 potential customers which private utility companies might serve by building 1,214 miles of extension lines in farm areas.

It was asserted by the commission that if the lines were constructed the utilities would be reaching every potential customer in the state, down to a population density of three buildings to the mile. The thirteen utilities with rural territory now supply electricity to 472,000 customers.

The commission pointed out that in the past six years 1,207 miles of rural extension have been built and 6,723 new customers added.

Connecticut Light & Power Company has put into effect, as of October 1, a new and lower rural extension rate for three-to-the-mile customers. The minimum charge is $6 for 100 kw.-hr.

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Answer to TVA Suit Filed by Government

Opposition to the suit filed by fourteen utilities to test the constitutionality of the TVA was expressed by the government in the reply brief filed last week with the Supreme Court. The court will hold oral arguments on November 14.

The government maintained that the TVA is not carrying on or does not threaten to carry on any activity legally injurious to the utilities. It was argued that the power produced by the TVA is necessarily acquired in the operation of works constructed for the improvement of navigation and the control of floods.

Outcome of the case before the court will largely determine the future power policy of the government in the TVA area.

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Power Lines Restored

Power lines are being restored in northern Wisconsin and the upper Michigan peninsula following the havoc created by the recent storm.

Boston Edison Plans Ash Annoyance Check

Vigorous efforts on the part of the Boston Edison Company to do away with cinder and ash annoyances resulting from stack discharges at the Edgar station in North Weymouth featured a recent hearing before the Massachusetts Department of Public Utilities ordered by a legislative resolve.

F. M. Ives, for the company, stated that the remodeling of four boilers at this plant to operate on pulverized coal has been under way for some months, and that when the work is completed, including the installation of Cottrell precipitators for the removal of fly ash, it is expected that more than 95 per cent of the trouble will be a thing of the past.

One boiler has already been equipped; the second should be in operation December 15; the third by March 15, and the fourth by next summer. The other four boilers in Edgar station will be utilized mainly on the peak. Mr. Ives said that the company is spending about $2,000,000 on this general improvement, and that increased economy of operation is expected to justify the outlay.

Michael C. O'Neill, chief of the commission's smoke division, said that the present capacity at Edgar is about 160,000 kw., and that when the four reconstructed boilers go into service about 130,000 kw. should be obtainable from them. He pointed out that no appreciable fly ash is obtained when using Cottrell precipitators. Mr. O'Neill declared that proposals of complainants against the company on behalf of inclosing the present coal field were fraught with danger in comparison with open ventilation.

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Asks Transfer of License

Kentucky Utilities Company has made application to the FPC Commission for transfer of the license for Project No. 539, a hydro-electric development located on the Kentucky River having a present installed capacity of 3,000 hp., to a consolidated company to be formed by the merger of Kentucky Utilities Company and the Lexington Utilities Company. The proposed new corporation, the application states, will accept all the terms and conditions of the license as they now exist.

The development, located in the vicinity of Burgin, Mercer County, consists of a power house with 3,000 hp. installed capacity, an outdoor substation and a 33,000-volt transmission line connecting with lines of the licensee in Jessamine County.

Ross Sets New Low Retail Rates for Resale of Bonneville Power

Objective rate schedule ranges from 2½ cents down to ½ cent a kilowatt-hour — Charges are lower than those set by TVA — Public agencies will be allowed latitude until districts operate profitably

An "objective" rate schedule, ranging from 2½ cents a kilowatt-hour down to ½ cent, at which public power districts, cities and co-operative associations may retail Bonneville power, was announced last week by J. D. Ross, administrator of the Bonneville project.

The proposed rates are somewhat lower than the residential rates set up by the Tennessee Valley Authority several years ago, to which municipalities in most cases reportedly have not been able to adhere. In the TVA schedule the first step was 3 cents a kilowatt-hour for the first 50 kw.-hr. a month, in contrast with the 2½ cents proposed in the Bonneville schedule; from this point the two schedules are about the same.

Schedule may vary

In announcing the schedule Administrator Ross admitted that, at the start, most public agencies will have to charge more than the objective rate, and "they freely will be allowed to do so." This is particularly true, he said, where there is duplication of distribution facilities.

"Two systems cost twice as much as one," he added, "and until a public monopoly is secured in such areas higher rates necessarily will prevail. As districts build their loads and eliminate wasteful competition and duplication of equipment, rates rapidly will drop to the objective level, and below it." On November 8 several districts in this area will vote on the question of establishing power districts.

The proposed rate schedule, in cents per kilowatt-hour, follows:

First 50 kw.-hr. a month	2½
Next 150 kw.-hr. a month	2
Next 100 kw.-hr. a month	1
Next 1,700 kw.-hr. a month	½
All over 2,000 kw.-hr. a month	¾

Minimum monthly bill—50 cents per meter.

While the proposed resale schedule will be the uniform pattern for Northwest districts, Mr. Ross said it will not apply to private utility systems. Resale conditions for power company contracts are being developed and will be issued later, he stated.

In a pamphlet sent to its customers ten days before the rate announcement the Northwestern Electric Company defined its policy with respect to Bonneville power. This policy, according to the report, "has been and is to purchase such amounts of Bonneville energy as can be utilized advantageously in its system and to pass on to its customers any savings that may result. The Bonneville rates established under the act of Congress do not discriminate between utility companies and public agencies."

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REA to Finance Two Generating Plants

REA has allotted funds for two generating plants—one in Ohio and one in Wisconsin. The Ohio generating plant, for which $237,000 was allotted, will be constructed in Preble County by an association of power distribution co-operatives in that section of the state. These co-operatives, according to REA, have been unsuccessful in their efforts to obtain satisfactory contracts for the purchase of electricity at wholesale. The amount allotted for this generating plant is part of the sum set aside earlier for a generating plant in the northwestern corner of the state. Because the co-operatives there have been able to obtain a substantial reduction in the quotations for wholesale energy, a definite allotment for a generating plant in the Toledo area has been deferred pending the outcome of negotiations now being conducted.

The allotment for the Wisconsin plant is $500,000. The plant will be constructed in the southwest corner of the state and operated by an association made up of REA-financed distribution co-operatives throughout that section.

Both the Ohio plant and the Wisconsin plant will be located in the approximate centers of their load areas. Several optional sites are now under consideration, and one in each state will be selected in the immediate future.

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Forms Original Cost Unit

A new division of original cost has been formed by the Federal Power Commission in its bureau of finance and accounts. This action follows the establishment of original cost of properties devoted to utility service as the new basis of electric utility accounting under the Uniform System of Accounts prescribed by the FPC, the system also having been adopted in principle by 24 state regulatory commissions.

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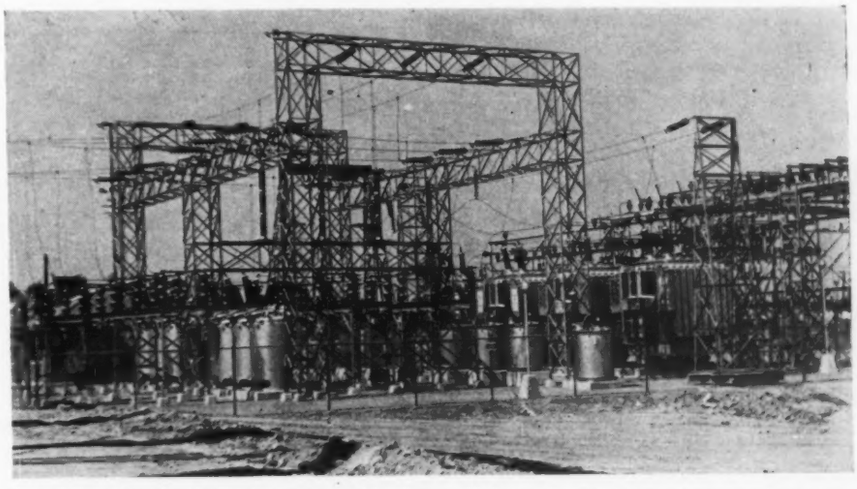
Alabama Power Completes New Modern Substation

One of the largest transmission substations in the country serving an individual customer has recently been completed by Alabama Power Company to serve the new $30,000,000 tinplate mill of the Tennessee Coal, Iron & Railroad Company in Birmingham.

The station contains four 23,000-kva. transformers to change the incoming 110,000-volt supply to 44,000 volts and 6,900 volts. There are two 110,000-volt, one 44,000-volt and one 6,900-volt breakers, together with 110,000-volt metering equipment and various auxiliaries. A brick switch house contains the board, relay equipment and storage battery.



NEW SUBSTATION—Alabama Power recently completed this substation to serve the new $30,000,000 tinplate mill of Tennessee Coal, Iron & Railroad Company in Birmingham. It is one of the largest in the country serving an individual customer

Owens, Corning Form New Fiber Glass Unit

Owens-Illinois Glass Company and Corning Glass Works announced this week the formation of Owens-Corning Fiberglas Corporation, which will produce a variety of products made from fiber glass.

The results of the extensive research facilities of these two companies, the products to be manufactured by the new corporation, are said to promise revolutionary developments in many fields of insulation, construction and industrial design. It marks the culmination of development work by the two companies involving expenditures totaling approximately $5,000,000.

Joint announcement of the new corporation was made by Amory Houghton, chairman of the board, and Harold Boeschenstein, president.

It was stated that the new corporation will be financed jointly by Owens-Illinois and Corning and is an independent corporate structure. It will not operate as a subsidiary of either parent company and no stock will be offered to the public.

Mr. Houghton, chairman of the new corporation, is president of Corning. Mr. Boeschenstein, president, has resigned as vice-president and general manager of Owens-Illinois. Other officers of the new corporation include James Slayter, vice-presidednt; W. P. Zimmerman, formerly general manager of industrial products division of Owens-Illinois, vice-president in charge of manufacturing and sales; G. E. Gregory, former sales manager of fiber glass products of Corning, general sales manager; A. C. Freligh, formerly controller of fiber glass products of Corning, secretary; H. R. Winkle, formerly assistant controller of Owens-Illinois, controller.

The board of directors is composed of C. B. Belknap, Harold Boeschenstein, U. E. Bowes, Glen W. Cole, Amory Houghton, William E. Levis and George D. Macbeth.

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Foresees Direct Conversion of Heat to Electric Energy

Generation of electric power directly from the combustion of fuel without intermediate conversion to mechanical power was seen as a possibility by Dr. L. W. Chubb, director of the Westinghouse Research Laboratories.

Speaking before the American Society for Testing Materials, Dr. Chubb added: "Laboratory and analytical work shows most promising results. It is too early to predict the possible future of this research. However, higher efficiencies are indicated that are now obtainable in the present power plant using rotating machinery." Dr. Chubb also reported that Westinghouse is now building a mass spectrograph as an undertaking in pure scientific investigation.

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Electrical Group Meets at Foreign Trade Convention

Some 60 executives and representatives of electrical firms operating in foreign fields discussed current problems and questions of export practice at an electrical group session of the National Foreign Trade Council, which held its annual convention in New York City this week.

John W. White, vice-president and general manager of Westinghouse Electric International Company, served as chairman of the meeting, the first to be held at such a convention. John H. Payne, chief, electrical division, Bureau of Foreign and Domestic Commerce, served as counsellor.

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Installs Meter Course

A specialized course in electrical meter engineering has been installed by the Fort Wayne (Ind.) Correspondence School. The planned instructions give complete details together with illustrations of equipment.

Meetings

Southeastern Electric Exchange—General sales conference, Henry Grady Hotel, Atlanta, Ga., November 11–12. J. W. Talley, executive secretary, 308 Haas-Howell Building, Atlanta, Ga.

Edison Electric Institute — American Gas Association—Second annual accounting conference, Palmer House, Chicago, Ill., November 12–14.

National Association of Railroad and Utilities Commissioners—Annual meeting, New Orleans, La., November 16–18. Clyde S. Bailey, secretary, Earle Bldg., 13th and E. Street, Washington, D. C.

International Association of Electrical Leagues—Annual conference, Architects Building, Philadelphia, Pa., November 17–19. O. C. Small, secretary, 155 East 44th Street, New York City, N. Y.

American Institute of Electrical Engineers—Annual meeting, southern district, Miami, Fla., November 28–30. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., December 5–9. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Thirteenth National Exposition of Power and Mechanical Engineering—Grand Central Palace, New York, December 5–10. Charles F. Roth, manager, Grand Central Palace, New York.

American Association for the Advancement of Science—Winter meeting, Richmond, Va., December 27–31.

AEC to Hold Second Forum in Detroit

The second forum of the American Engineering Council will be held in Detroit on November 11 at the Hotel Statler, with the Michigan Engineering Society acting as host. The subject chosen for the forum is "Invention and the Engineers' Relation to It." The meeting will open with a luncheon. Greetings from the president of the Michigan Engineering Society, Dean H. B. Dirks, will be acknowledged by Dr. William McClellan, president of the American Engineering Council.

At the afternoon session Frederick A. Allner, vice-president Pennsylvania Water & Power Company, and chairman of the AEC public affairs committee, will discuss the plan and purpose of forums of American Engineering Council. Kenneth H. Condit, National Industrial Conference Board, will make an address on "Social and Industrial Values of Research and Patents" and Dr. Lyman J. Briggs, Director National Bureau of Standards, will discuss the "Place of Government in Research."

Dr. Frank B. Jewett, vice-president American Telephone and Telegraph Company, will make an address on "Patents—One Product of Research," at the evening session.

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Menominee to Vote on Plant

Menominee, Mich., Common Council has voted to place before the voters at the November 8 election the question of whether they desire a municipal light and power plant. The Council has also adopted a resolution that the Menominee & Marinette Light & Traction Company be given reasonable notice to vacate the streets and public places and that the city take appropriate action to compel the company to cease occupying the same. The utility company has been operating since 1921 without a franchise.

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Illinois Towers Blasted

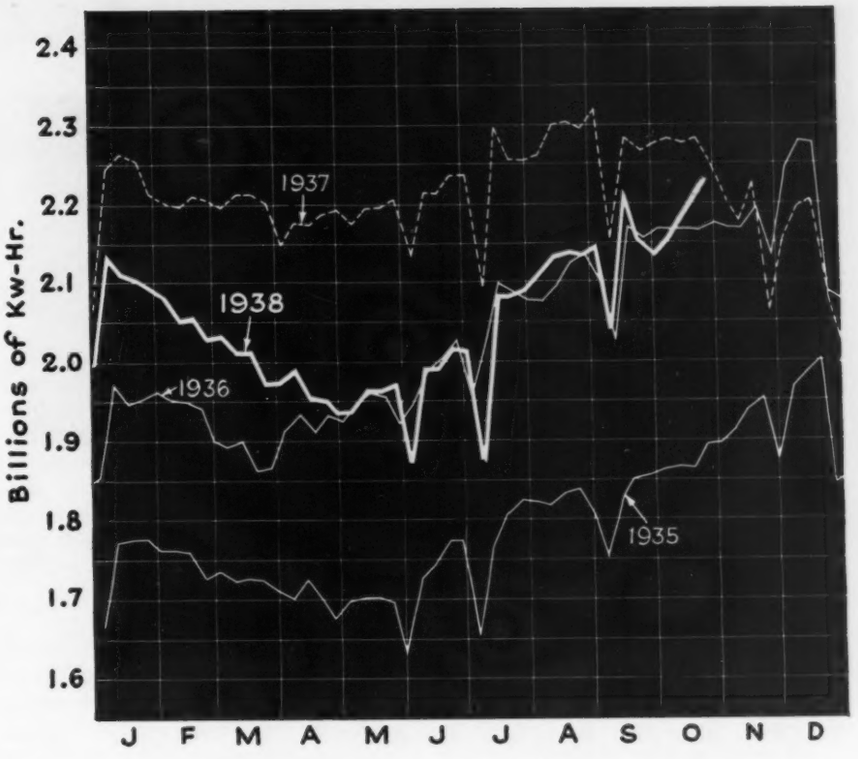
Marking the third incident of the kind in the past five weeks, two adjoining 35-kv. steel towers of the Central Illinois Public Service Company were wrecked by dynamite blasts last week, the explosions occurring 4½ miles northeast of Carbondale. Previous blasts were also on this main line, which serves communities and coal mines in Jackson, Franklin, Williamson and Johnson counties. Officials said they had no clew to the motive behind the blasts nor to the identity of the vandals, but suspected the work was that of a crank.

Output Rises to New Record for 1938

Surpassing all previous figures in 1938 and approaching closer to those of 1937 than in any other week, the output of the electric light and power industry rose to 2,226,038,000 kw.-hr. during the week ended October 29, according to the Edison Electric Institute.

More significant than the narrowing of the gap, compared with a year ago, is the gain over 1936. This has now grown to 2.8 per cent. For nearly six months the curves for the two years were almost identical. The returns for the past two weeks reveal a definite rise into a higher level.

For the first time since last December three geographical regions report gains over a year ago. New England is up 3.7 per cent, after a long period of deficiencies, accentuated by the sag of 18.4 per cent in the week of the hurricane. The Middle Atlantic and Pacific States are 2 per cent over 1937. In the Central and Mountain States the disparities have dwindled to a fraction of their recent amounts.



Per Cent Change from Previous Year

	Week Ending		
	Oct. 29	Oct. 22	Oct. 15
New England	+3.7	+2.6	− 0.2
Middle Atlantic	+2.1	−0.2	− 0.5
Central Industrial	−5.5	−8.2	− 9.3
West Central	−3.2	−2.6	− 3.5
Southern States	−1.7	+0.7	− 1.3
Rocky Mountain	−4.9	−9.2	−14.5
Pacific	+2.0	−0.3	+ 1.0
United States	−1.3	−3.0	− 4.1

Weekly Output, Millions Kw.-Hr.

1938	1937	1936
Oct. 29..2,226	Oct. 30..2,255	Oct. 24..2,167
Oct. 22..2,214	Oct. 23..2,282	Oct. 17..2,170
Oct. 15..2,183	Oct. 16..2,276	Oct. 10..2,168
Oct. 8..2,154	Oct. 9..2,280	Oct. 3..2,169
Oct. 1..2,139	Oct. 2..2,276	Sept. 26..2,157
Sept. 24..2,154	Sept. 25..2,266	Sept. 19..2,171

Willkie Plans Answer to Chattanooga Board

Answer to the request of the Power Board of the city of Chattanooga that negotiations be resumed for partial sale of properties of Tennesee Electric Power Company will be made by Wendell L. Willkie, president of Commonwealth & Southern, it was stated this week.

The Power Board indicated that it desired to conclude negotiations since it was now in a position to go ahead with construction of its own system, having received a further gift and loan of $3,279,000 from the P.W.A. The total gifts and loans to date made to Chattanooga approximate $7,500,000.

Mr. Willkie indicated that the company is now forced to negotiate for immediate sale of part of its properties instead of disposing of the company as a whole. This action is necessary, he said, to prevent destructive competition.

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Utah Power Deal Approved

Dissolution of the Bountiful Light & Power Company and acquisition of its assets by the Utah Power & Light Company has been approved by the Utah Public Service Commission. Utah Power & Light owns the stock of the smaller utility and in return for the physical properties will cancel the outstanding stock. Last July the Bountiful Light & Power Company sold its distribution facilities in Bountiful to the city and since that time its business has been in Woods Cross, Centerville and adjacent territory.

•

September Output 4% Under Year Ago

Production of electric energy for public use in the United States totaled 111,671,000,000 kw.-hr. for the year ended September 30, a decrease of 5 per cent from the previous year, according to the Federal Power Commission.

Total production in September was 9,593,000,000 kw.-hr., a decrease of 3.3 per cent from the previous month and of 4 per cent from September last year. Daily production in September was 319,766,000 kw.-hr., 0.1 per cent less than the average daily production in August. This is contra-seasonal; the normal change from August to September is a gain of 1.1 per cent.

These data exclude the output of electrified railroads, electric railways and certain state and federal plants not producing energy for public use.

During September, electric utility power plants consumed approximately 3,511,497 net tons of coal, making a total stock on hand on October 1 of 9,331,824 tons, an increase of 1.9 per cent from September 1 and a decrease of 9.3 per cent from October 1 a year ago.

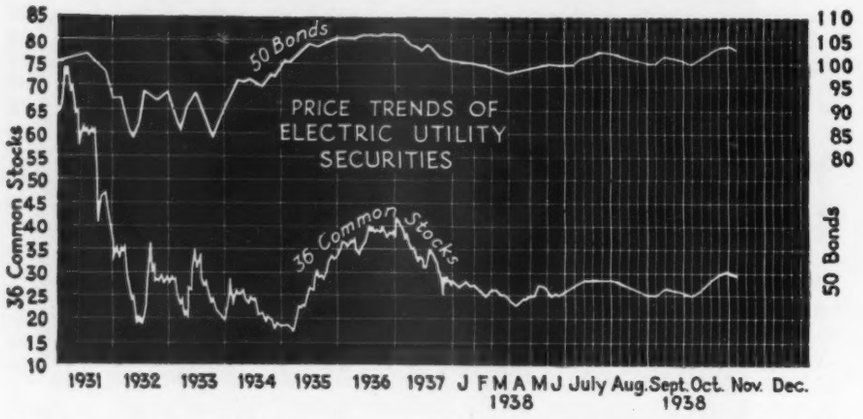
•

Hopson Must Appear at Investigation, Court Rules

The Appellate Division, Third Department, in Albany has unanimously refused to review a New York State Supreme Court decision that Howard C. Hopson and five other individuals must appear before the Public Service Commission in its investigation of the New York State Electric & Gas Corporation. Those subpoenaed must present records of their association with the investigated utility and their activities in other corporations in the last ten years.

Motion of the New York State Electric & Gas Corporation to stay the investigation until the commission was more specific about what it was seeking was also turned down by the appellate court.

Utility Stocks Dip; Bonds Gain Slightly


50 Bonds
PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1938 1938

After a spurt upward, following the national defense policy announcement last week, utility stocks dropped backward. For the week the "Electrical World" stock index was off 0.3 point to 30.0; the bond index fared better, gaining 0.2 point to 102.9

Merger in Milwaukee Nears Completion

Another step in the separation of the electric and transportation properties of the old Milwaukee Electric Railway & Light Company, under its refinancing program, was consummated October 28 with the election of R. H. Pinkley as president of the Milwaukee Electric Railway & Transport Company, wholly owned subsidiary of the Wisconsin Electric Power Company.

Mr. Pinkley resigned as a vice-president of the electric company to become president of the transportation company and in announcing his election, S. B. Way, president of Wisconsin Electric Power, also revealed the promotion of L. F. Seybold from assistant vice-president to vice-president of the electric company. Mr. Way will serve as chairman of the board of the transportation company.

SEC has recently granted exemption from certain provisions of the Public Utility Holding Company Act the $55,000,000 issue of first mortgage bonds, 3½ series of 1968, of Wisconsin Electric Power and also the $14,500,000 issue of 3.4 per cent unsecured promissory notes.

•

Power Associates to Avoid Holding Company Status

Electric Power Associates, Inc., has taken steps to divest itself of the major portion of its investment in American Water Works & Electric Company common stock in compliance with the provisions of the Public Utility Act. The operation is to be effected by the payment of a dividend on the class A and common stock of Electric Power Associates in the form of American Water Works common stock. Stockholders of November 2 will receive for payment November 18 one-quarter share of American Water Works common for each share of Electric Power Associates common and class A stock.

As there are 800,000 shares of common and class A stock of Electric Power Associates outstanding, approximately 200,000 shares of American Water Works common will be distributed out of a total of 235,193.

•

SEC Exemption Given to Virginia Company

Virginia Public Service Company has been granted a declaration exemption application under the Utility Act by the SEC subject to condition that no dividend will be declared on the common stock without commission approval. A further condition was imposed requiring the company to surrender to the trustee for cancellation $1,032,000 of 5 per cent first and refunding mortgage bonds of Newport News & Hampton Railway, Gas & Electric Company now held in its treasury.

Application was for an exemption from the declaration requirements of the utility act of issue and sale of $677,000 of 5 per cent bonds of Newport News & Hampton Railway company. Proceeds are to be used to retire a like amount of 5 per cent first mortgage bonds of Newport News & Old Point Railway & Electric Company. The commission asserted that the ratio of the company's long-term debt to its net property was "far in excess of what a sound capital structure would permit" and if possible should not be perpetuated by permitting the company to issue new debt of a like principal amount to refund maturing bonds.

Another condition imposed by the commission requires the company to expend not less than 16 per cent of electric and gas gross and 25 per cent street railway gross for maintenance, retirements, renewals and replacements.

•

North American Net Totals $13,626,139

Consolidated net earnings of the North American Company and subsidiaries for the twelve months ended September 30 were equal to $1.59 per share of North American common stock, according to the quarterly letter of J. F. Fogarty, president, to stockholders. This compares with $1.68 per share for the twelve months ended June 30 and $2.05 per share for the twelve months ended September 30, 1937. Consolidated net income of the North American Company and subsidiaries for the twelve-month period ended September 30 was $15,445,216. The balance for common stock, after all deductions including preferred dividends, was $13,626,139, a decrease of 22.58 per cent from the balance of $17,600,320 for the twelve months ended September 30, 1937.

The larger part of the increase in total expenses was represented in total tax provisions, which amounted to $18,332,742, equivalent to 15.67 cents out of each dollar of operating revenues, as compared with 14.36 cents a year ago.

Electric output in the third quarter showed the smallest percentage decrease of any quarter this year compared with the corresponding period of 1937. The continued load-building activities of North American subsidiaries, conducted through sales programs in co-operation with dealers in electrical appliances, have contributed to the increase in the average use for residential service and have helped toward leveling the effect of lessened industrial use.

Utility Reports (Earnings)

	Net Income 1938	1937
*North American and subs.	$15,445,216	$19,419,397
*Philadelphia Elec.	30,932,811	22,573,381
*Cleveland Elec. Illum.	6,511,064	7,441,982
*Boston Edison	5,122,692	5,468,262
*Oklahoma G. & E.	2,407,869	2,710,611
*Wisconsin Pub. Serv. and sub.	1,324,434	1,463,876
*San Diego Cons. G. & E.	1,323,327	1,393,474
*Kansas City Pwr. & Lt.	4,107,707	4,482,729
*Florida Pwr. & Lt.	2,456,140	1,694,769
*Utah Pwr. & Lt. and subs.	1,306,358	1,691,165
*New Orleans Pub. Serv.	1,274,859	1,044,840
*Texas Pwr. & Lt.	2,085,453	2,143,906

* Twelve months ended September 30.

THOMAS L. SKINNER, TREASURER

J. BRODIE SMITH, VICE PRESIDENT AND GEN MGR.
AVERY R. SCHILLER, VICE PRESIDENT IN CHARGE OF OPERATIONS

WYMAN, PRESIDENT

Public Service Company of New Hampshire

MANCHESTER, N.H.

UNSOLICITED letters like this reward the pioneer work and persistence of our engineers who developed power-line carrier current. Be sure to read it.

September 27, 1938

T. S. Knight, Vice President
General Electric Company
140 Federal Street
Boston, Mass.

Dear Mr. Knight:

Now that the first few hectic days of rehabilitation are over, we are beginning to look back over the trying times through which we passed since the flood and hurricane of September 21st. As we do this, we in the Public Service Company of New Hampshire are all agreed that the two things which stand out more than any other are the great self sacrifice of our own employees to maintain and restore service, even at the risk of life and limb, and the patience and understanding of our many customers who were without electric service.

In the desire to give credit where credit is due, I want you to know that one of the most helpful tools which we had during the days of greatest trouble was our carrier-current telephone system, designed and installed by the General Electric Company. I do not know how we would have gotten along without it. It has operated over transmission lines which have had all conductors sagged to earth by fallen trees and line structures, over lines which had broken conductors and over lines purposely grounded at both ends to protect line crews engaged in repair work. For a long time it was the only means of communication available between our headquarters in Manchester and several of our communities and power stations. Even as I write this letter, six days after the hurricane, the carrier-current telephone system is the only means of voice communication with Keene, which is approximately sixty miles from Manchester.

We have come to the conclusion in connection with the carrier-current system that it is a device which we could not afford to be without. We have lived with it now through both flood and hurricane and know of its great value in times of emergency.

Sincerely yours,

A. R. Schiller

ARS:L

GENERAL ELECTRIC

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Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Build Line on Piles to Withstand Floods

By FLOYD F. GATEKA
Construction Foreman
Southwestern Light & Power Company
Lawton, Okla.

Transmission lines crossing river bottoms are subject to outages due to high water cutting new channels and washing out the poles. The Southwestern Light & Power Company solved this problem by driving 35-ft. piling in sections subject to this type of trouble and banding the transmission line poles to the piling. The manner in which this work was done is illustrated by the accompanying illustrations.

The rig for driving the piles was assembled by the crew that did the driving. It consisted of a hammer which, with its follower, weighed 5,000 lb.; a standard two-drum contractor's hoist for handling the hammer and 44-ft. wooden leads for guiding it. A heavy hammer and a short drop was found by experience to give the greatest penetration.

All piling was driven to 27 ft., leaving 8 ft. above ground and giving a 6-ft. spacing between pole bands. Poles which were banded to the piles were set on the top of the ground to give greater ground clearance. Piles were driven with the ground wire attached. Before driving, the butt of the pile was trimmed to fit the follower, the ground wire put on and the small end of the pile given a rough point.

Time required to drive individual piles varied with the soil conditions. On one location nine blows drove the pile the full 27 ft. In most cases, however, more blows than this were required. After driving the piling was capped to protect it from moisture. A 4-in. tin band was tacked around the top of the piling and ¾ in. of asphalt poured into the cup thus formed. The remaining portion of the tin was pounded down over the top of the asphalt.

The hammer and the rig were transported to the job on a pole trailer behind the line truck. The rig was raised by means of the winch and boom on the truck and guyed four ways with 1-in. manila rope. Blocks were used in each guy line to provide a means to plumb the lead.

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TransformerCleaning Raises Probable Life

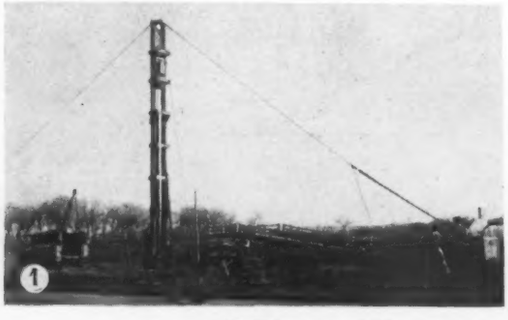
By J. B. PRINCE
Underground Foreman,
Sioux City Gas & Electric Company,
Sioux City, Iowa *

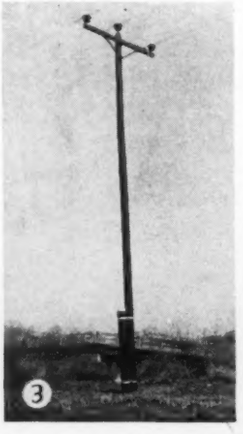
Less than 10 per cent of their original cost, spent for shop cleaning of a group of subway type transformers in service twenty years or more on the system of the Sioux City Gas & Electric Company, has given assurance that these units will continue to perform satisfactorily until conditions will allow an intended secondary network to be installed.

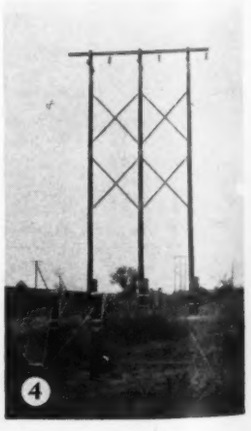
The 22 transformers cleaned totaled 935 kva. Man-hours of labor were 560 and the cost for labor and trans-

* Adapted from paper to Engineering Conference, Missouri Valley Electric Association.

(1) Pile driving rig in place with 35-ft. pile set and driving about to start. Double winch for raising the hammer is at right. (2) The pole, set on the top of the ground to increase clearance, is raised and banded to the pile. (3) Completed job (4) Rebuilt river crossing with the structure guyed to three piles

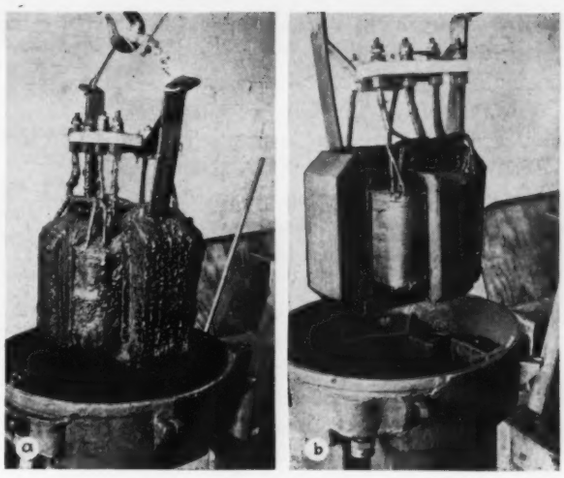






Build transmission line on piles as protection against frequent washouts by floods

portation, neglecting the slight cost for paint and other material used, was $249. The cost for servicing was 26.6 cents per kva., to which is added 29.9 cents for handling to and from the shop, making the complete cost 66.5 cents per kva. Lack of headroom in the vaults made it necessary to bring the transformers into the shop for cleaning. Details of cost are shown in the accompanying tabulation. A record was kept of each transformer brought in. This record consisted of megger readings, condition of oil, case, windings, oil ducts, etc., before and after servicing. In a number of cases the lead cable sheath inside the transformer showed signs of turning to white lead and in some it had completely changed to a white mass. We believe this was caused by the high acid content of the oil.



Transformer before and after cleaning

Another effect of oil on lead was noticed on a number of soldered lugs. About half of the transformers had loose secondary and primary lugs. These were submerged in oil and no disintegration effect could be noted, yet the conductors were loose in the lugs. Lugs were removed and the conductors brazed in instead of soldered. Primary and secondary leads inside of the transformers were cleaned and the lead was painted with oil-resisting paint. Varnished cambric tape was wrapped over the lead to within an inch or two of the lug. No disintegration of the lead was apparent where the lead was protected from the oil inside the transformer.

In most cases filtering of oil was all that was necessary, but some oil was found to be beyond reclaiming. About half of the oil was removed and the core washed with that remaining. The rest of the oil was removed and filtered where conditions warranted. The core was then cleaned and the oil ducts cleared. Terminal blocks were cleaned and lugs inspected. The underside of the cover was scraped and painted with oil-resisting paint. The outside of the case was cleaned and painted with Ferrubron paint. When the job was complete the transformer was meggered and given a voltage test. In practically all cases the megger readings improved considerably.

Costs for Shop Cleaning of Subway Transformers

Transformer Sizes, Kva.	Number	Servicing Costs/Kva.	Handling Costs/Kva.	Complete Costs/Kva.	Original Costs/Kva.
15	4	$0.67	$1.13	$1.80	$13.00
25	5	0.36	0.68	1.04	11.50
50	11	0.282	0.343	0.625	7.35
100	2	0.262	0.17	0.432	6.23
Average costs/kva.		0.313	0.401	0.715	9.10

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Test Meter Clocks With Paper Load

Sometimes it happens that the chart drive clock for a recording meter will operate perfectly on the clock regulating board in the laboratory and then will lie down on the job or run slow when it is installed in the instrument and put out in service. This is because the added load of driving the record paper roll is too much for the clock mechanism.

In order to be sure that each clock will be capable of performing its duty all those that go out from the instrument laboratory of the Milwaukee Electric Railway & Light Company are regulated under the conditions in which they will operate. The regulating board contains eight positions, each with standard paper rolls and pen. Thus each clock is regulated as it carries the load it will have in service.

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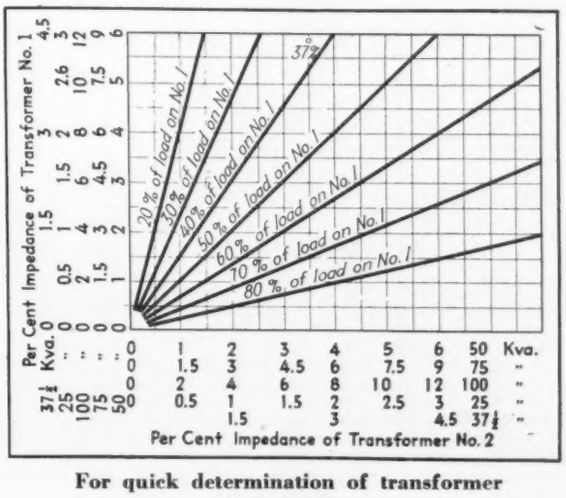
Load Division in Parallel Transformers

By B. E. ELLSWORTH
Electrical Engineer,
Iowa-Nebraska Light & Power Company,
Lincoln, Nebraska

It is often necessary to parallel distribution transformers because of increased loads, temporary loads or because of emergency conditions. When speed is necessary the transformers are usually paralleled first and the division of load calculated or measured afterward. The accompanying curves will be found convenient for finding the division of load in 30 seconds if transformer impedances are known. The only assumption made is that the impedance angle is the same for both transformers; that is, the resistances and reactances of the transformers are in the same ratio.

As an example, here is an emergency case where, due to transformer burnout, it was necessary to parallel a 50-kva. transformer of 3.5 per cent impedance with a 25-kva. transformer of 2.95 per cent impedance. From the curve, if the 25-kva. transformer is called No. 1, it will carry 37 per cent of the load, although its proper proportion, according to size, would be 33 per cent. As a result the 25-kva. unit will be carrying full load, while the 50-kva. is carrying but


Per Cent Impedance of Transformer No. 1
Per Cent Impedance of Transformer No. 2
Kva.
37½
20 % of load on No. 1
30 % of load on No. 1
40 % of load on No. 1
50 % of load on No. 1
60 % of load on No. 1
70 % of load on No. 1
80 % of load on No. 1

For quick determination of transformer load division

85 per cent load. All transformer sizes may be multiplied by ten for transformers larger than 100 kva.

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Simplify Testing of Three-Element Meter

By L. F. BRADFORD
Meter Shop Foreman
Georgia Power Company, Atlanta, Ga.

Three-element meters are necessary for accurate measurement of unbalanced loads served by four-wire, three-phase Y systems. These meters are difficult to calibrate because they must be within 1 per cent of correct on full and light loads unity power factor, and full load 50 per cent power factor on any element when it operates alone and one-half of 1 per cent at these points when they operate together. Changing the calibration at any one of these twelve points affects the accuracy of the other eleven, frequently enough to put some of them beyond the allowable limits. Instant availability of any point is therefore essential.

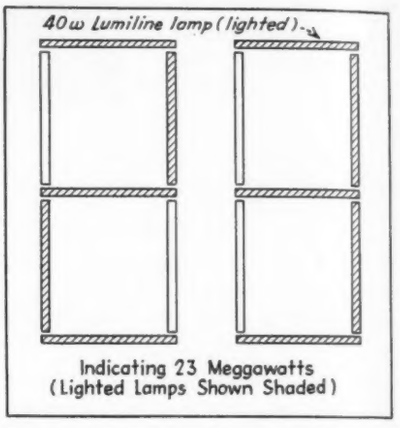
Prior to the construction of the table illustrated our equipment was designed for two-element testing; entirely satisfactory for meters having not more than two current coils, but it was necessary to use jumpers and do some lead swapping to change from one element to another or to series checks on three current coil meters.

Leads need never be touched on this table from start to finish; all twelve points and many others are readily accessible by opening or closing switches. The flow of current in the middle element may be reversed by means of a "bucking" switch, thus eliminating crossing of leads for "Z" coil meters and making possible bucking of elements for approximate selection of disks and balancing of top to middle and middle to lower elements. Instant changing from full to light load is accomplished with a two-pole, double-throw switch. Two three-point radial switches provide all element and series selections and a single-pole, double-throw switch shifts the voltage 60 deg. from unity to 50 per cent lagging power factor.

Copper bus, $\frac{1}{8}$ by 1 in., was used for the low-voltage current circuit. It is possible to fold this material in such a manner that compact construction and pleasing appearance are obtained on right-angle bends. These folds were made without the application of heat and all pinned or soldered joints eliminated. Panel markers over switches, etc., are nickel silver disks embossed in black enamel with the desired information. A short wood screw soldered to the back of each disk secures it to the panel. A detachable wood and metal bracket may be used to support the meter near the tester for convenience in adjusting and inspecting. The resistance pack is made up of standard States Company wire resistors in units of $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 2, 5 amp. for light loads. Single-pole, single-throw loads of 5, 10, 20, 20 amp. for full loads. Single-pole, single-throw switches provide desired selection to a maximum of 50 amp.

Make Load Indicator From Lumiline Lamps

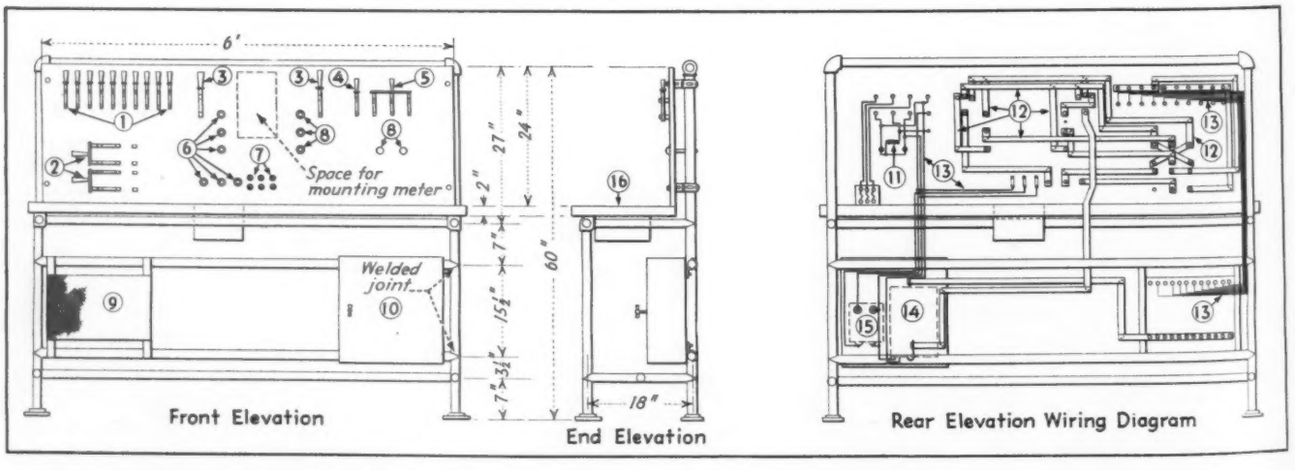
Load being carried by the 48,425-kva. steam plant of the Stamford Gas & Electric Division of the Connecticut Power Co., Stamford, Conn., is indicated to operators on the turbine floor by an ingenious arrangement of fourteen Lumiline lamps in two groups of seven lamps each.



Fourteen lumiline lamps make novel load indicator for steam plant

Lamps are so combined that the numerical value of the loads from 1 to 99 megawatts can be shown in block letters by lighting certain lamps in each group and allowing others to remain dark.

The lamps, which are rated at 40 watts each, are arranged as shown in the accompanying sketch. They are mounted on a black Masonite board about 4 ft. x 4 ft. and are controlled by two rotary switches on the station control panel.



Devise compact testing table for three-element meters

Equipment identified by number on the above drawing: (1) switches, SPDT, 250 volt, 60 amp., (2) switches DPDT, 250 volt, 100 amp., (3) switches, SPTT, 250 volt, 100 amp., (4) switch, SPDT, 250 volt, 60 amp., (5) switch, TPST, 250 volt, 60 amp., (6) current studs, 75 amp., (7) potential studs, (8) potential lights, phase sequence indicators, (9) resistance rack complete with resistors, ¼-amp. through 20 amp., (10) transformer box, (11) potential coil, 250 volt, (12) copper bus bar ⅛ x 1 in., (13) wire No. 12 switchboard, (14) transformer, 1½ kw., 220/11 volt, (15) potential transformer, 220/110 volt, (16) table top, ½ in. laminations covered with battleship linoleum.

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

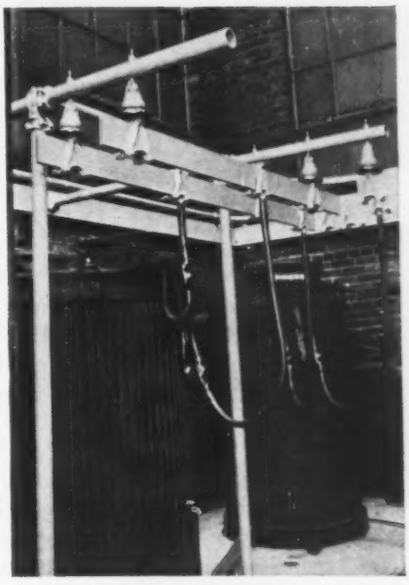
Revamp Distribution, Increase Efficiency

Rearrangement of the existing scheme for supplying power to the electrogalvanizing plant of John A. Roebling Sons Company, Trenton, N. J., has doubled the capacity of the transformer bank serving this department and reduced voltage drop and primary distribution losses, all at practically no cost beyond labor charges.

As shown in the accompanying "before and after" diagrams, transformers at the galvanizing plant were formerly supplied at 2,400 volts, three phase, through a 7.5-kv. underground cable from a transformer bank at the nearby Buckthorn plant which stepped the voltage up from 480 volts. This "step-up" bank at the Buckthorn plant and the "step-down" bank at the galvanizing plant were identical, each consisting of three 150-kva., 2,400/480-volt transformers.

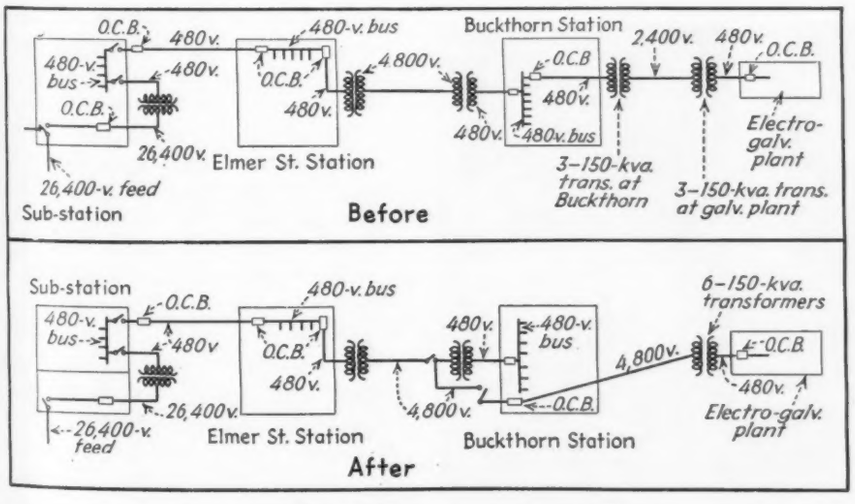
With increasing load on the galvanizing plant substation brought about by modernization of the electrogalvanizing equipment, it became desirable to increase the capacity of the bank supplying this plant. Consequently when it was found that the existing 7.5-kv. underground cable supplying the galvanizing plant could be safely operated at 4.8 kv., the step-up bank at Buckthorn was eliminated and the underground cable connected directly to the 4,800-volt line supplying the Buckthorn plant. Transformers that had been liberated at the Buckthorn plant were transported to the galvanizing plant. The six available 2,400/480-volt transformers were connected in delta with their primaries in series and their secondaries in parallel for operation as a 4,800/480-volt, 900-kva. bank.

These steps not only increased the capacity of the transformer bank at the galvanizing plant 100 per cent but, by eliminating one of the double transformations formerly undergone by power in reaching the galvanizing plant, reduced the system distribution losses about 7 per cent and voltage drop about 2½ per cent.



Suspension disks support outdoor secondary buses

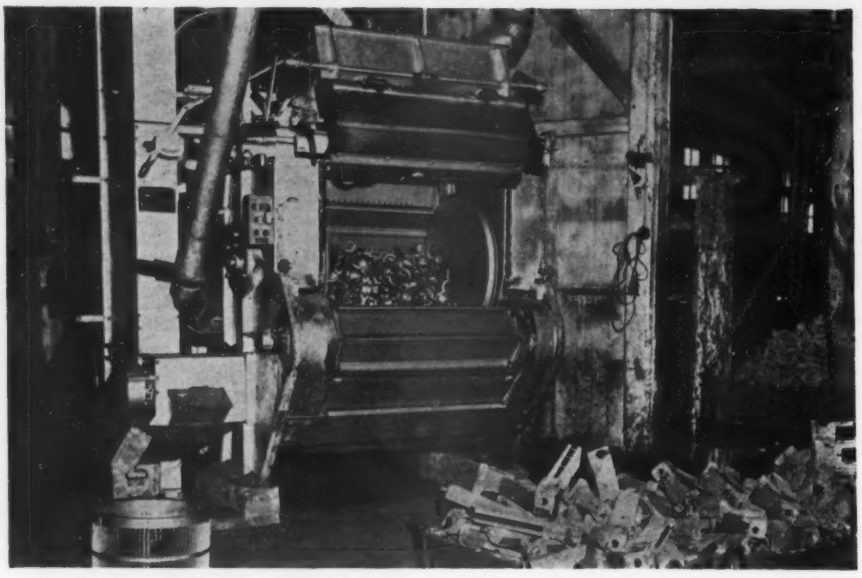
Disk supports keep bus structure below window level and will allow protective screen to be erected over bank in future. Only a portion of the transformer bank is shown.



Rearrange distribution system to decrease losses and increase transformer capacity

Substation construction

In arranging the six transformers at the galvanizing plant the heavy secondary buses were suspended in the manner illustrated from a tubular frame work by disk type insulators. Use of suspension disks instead of rigid insulators made it possible to keep the secondary buses below window level and will permit a protective screen to be erected over the transformer in the future to keep materials accidentally dropped from the windows from coming in contact with the buses.



Shot blast method of cleaning castings replaces compressed air sand blast and saves 46 hp.

Foundry Power Cost Cut by New Method

Castings at the foundry of the Charles Parker Company, Meriden, Conn., formerly were cleaned by sand-blasting in an inclosed space at a cost of about $2 an hour for compressed air supplied at 90 to 120 lb. per sq. in.

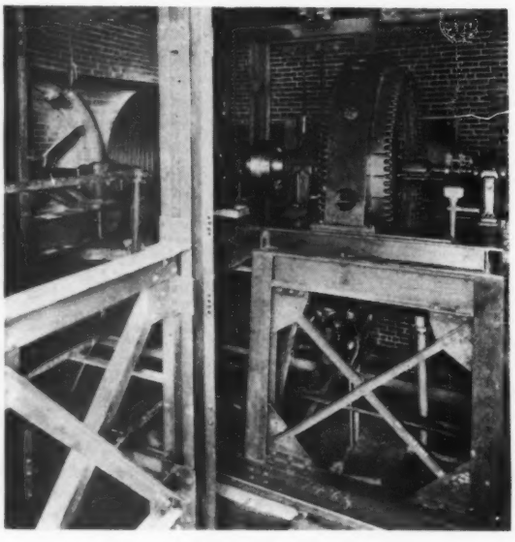
By installing a Wheelabrator "Tum-Blast" machine, a saving of 46 horsepower was effected, the new equipment requiring 29 hp. as against the 75 hp. needed for the compressor previously used. The new equipment is driven by a 15-hp. motor; a 2-hp. motor drives a conveyor and a blower required in the operation is driven by a 12-hp. motor.

The castings to be cleaned are carried by the conveyor to a point where an abrasive blast of steel shot is thrown on the work by centrifugal force from a high-speed wheel, the abrasive being returned to the center of the wheel by screw and bucket conveyors.

The machine is totally inclosed, and the user—a customer of the Connecticut Light & Power Company—states that besides doing a better and faster job, the machine's elimination of the dust hazard is a valuable asset.

SUPPORT 600-HP. MOTOR 25 FT. ABOVE BED

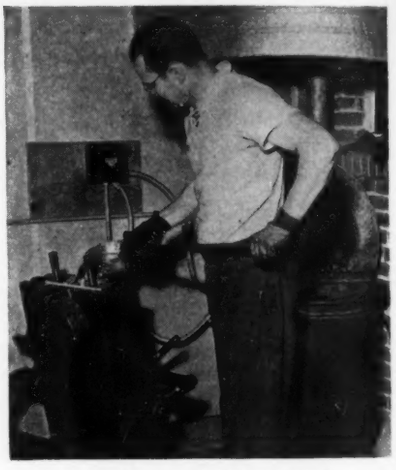
When power from the Union Electric Company of Missouri recently displaced Corliss engine drive in a flour mill of the Valier & Spies Milling Company in St. Louis, it appeared most economical and practicable to couple the 600-hp. synchronous motor replacing the engine directly to one of the three main line shafts of the mill, utilizing the existing rope drives for transmission of power to the two others. This required the motor installation to be about 8 ft. above the third floor level. The structure on which the motor is mounted rests on vertical steel members extending upward 25 ft. from the concrete bed below, from which the engine was removed. Credit for this novel motor installation goes to George W. Biggs, chief engineer of Valier & Spies.



Melting Problem Met With Special Design

By W. B. CHENEY
Industrial Heating Engineer
Southern California Edison Company

Two reasons are given for the installation in the plant of the Antelope Valley *Gazette-Ledger*, Lancaster, Calif., of electric heat for stereotype melting. The paper, which recently enlarged its facilities, wanted more efficient equipment. The combination of high summer temperatures and additional heat from an old fuel-fired pot was annoying and therefore detrimental to the work of the printers.



Specially designed 1000 lb. type metal pot consumes 0.015 kw.hr. per lb. of metal melted

To meet the plant's requirements a pot capable of containing 1,000 lb. of metal was needed. No ready-made equipment was available. A satisfactory design was evolved, however, by Southern California Edison Company engineers, who also supervised construction of the pot.

The resulting melting pot, 18 in. inside diameter and 12 in. depth, is made of welded steel instead of the usual cast iron. This is enveloped in rockwool insulation and a steel-supporting shell. An insulated, hinged cover closes the pot while in use.

Heating element is a 5-kw. cast-in Calrod operating at 220 volts, single phase, and controlled by a thermostat. With this equipment a 1,000-lb. charge can be melted from a cold start in about three hours. Consumption average is 0.015 kw.-hr. per lb. of metal melted.

91 conductors ...in place of 37

Comparison of Diameters and Weights of Lead Covered Control Cables

No. 16 A.W.G. Solid - 125 Volts A.C. or 250 Volts D.C.

Outside Diameter in Inches (approx.)			Net Pounds per 1,000 Feet (approx.)		
Number of Conductors	Usual Spec. Conductors Braided	Latox Spec. Conductors Braided	Number of Conductors	Usual Spec. Conductors Braided	Latox Spec. Conductors Braided
7	.594	.484	7	660	510
19	.969	.703	19	1439	1032
37	1.297	.938	37	2478	1525
61	1.609	1.141	61	3396	2070
91	1.969	1.375	91	4924	3015

The circle at the left is the size of a 91 conductor Simplex-LATOX Cable. The circle at the right is the size of a 37 conductor cable insulated according to conventional specifications.

The two cables are almost exactly the same size but the Simplex-LATOX Cable has 54 additional conductors. One way to put more control and signal circuits in an already crowded conduit – we believe it is the best way – is to replace conventional cables with Simplex-LATOX Cables.

These 54 additional conductors can be added to your present facilities – if you are using ordinary cables – with no additional conduit space, no tearing up streets for installation and no sacrifice of cable dependability. Simply pull out your old cable and pull in a LATOX Cable in its place. By making the change you will more than double your service possibilities.

Simplex-LATOX was developed in Simplex Laboratories to meet a definite need caused by modern day conditions. It was designed especially for the job of reducing weight and bulk and at the same time improving those physical and electrical properties necessary for efficient insulation.

Simplex-LATOX is ideal insulation for modern communication, signal and control cables. It makes possible an increase in circuit capacity and a reduction in capital investment. It combines the advantages of low weight and smaller cable diameter with high electrical and physical properties. Simplex-LATOX rubber insulation is permanent and retains indefinitely the qualities of high-grade rubber insulation.

Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.

Simplex – LATOX

Thin insulation made directly from rubber latex

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

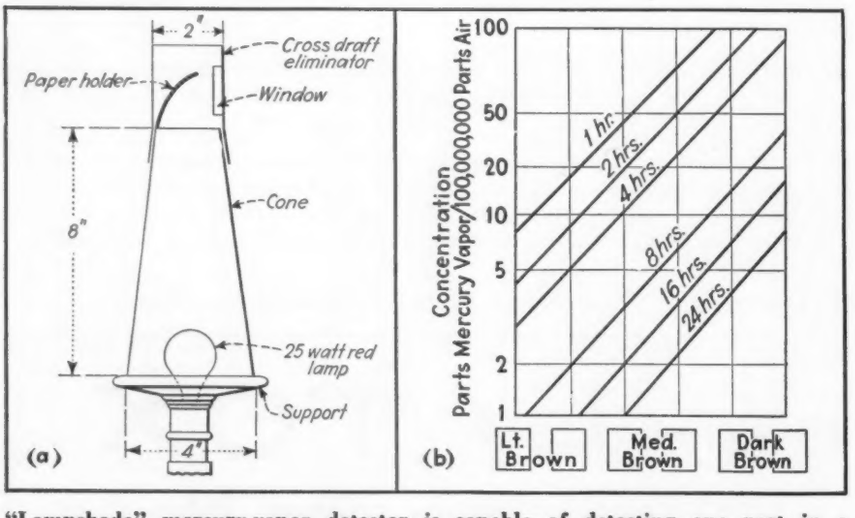
Device Detects Mercury Vapor In Air

One part of mercury vapor in a hundred million parts of air by volume can be detected and registered by a simple new device developed by the General Electric Company. This device makes use of the property of selenium-sulphide to turn dark brown when exposed to metallic mercury vapor. The degree of darkening depends upon the mercury vapor concentration, the velocity of air passing over the sensitive chemical, the temperature of the air and the time of exposure.

The detector is essentially a truncated cone of aluminum, supported by a Mogul base over a 25-watt red incandescent lamp. Fastened to the top of the cone is a holder accommodating strips of selenium-sulphide treated sensitized paper. A reasonably constant temperature and an upward flow of air through the cone and past the paper is provided by the red lamp in the cone's base. Air other than that from the cone is prevented from striking the paper by a cylinder mounted around the holder and fitted with a window that permits access to the paper holder.

A calibrated color chart is used with the detector. This chart has a horizontal scale consisting of six shades of brown for matching with the exposed paper, and a vertical scale that gives the concentration of mercury vapor in the air. Knowing the hours exposure of the paper its color can be matched with those on the chart and the mercury vapor concentration determined.

Natural color of the unexposed selenium-sulphide paper is a light yellow. The coating turns pink when exposed to high temperatures (roughly 100 deg. Cent.) or actinic light, hence the red rather than the clear bulb.



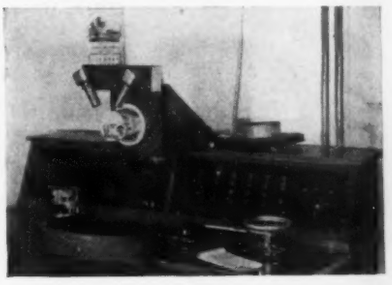
"Lampshade" mercury-vapor detector is capable of detecting one part in a hundred million

(a) Schematic sketch of detector; (b) Color comparison chart.

Electric Eye Device Speeds Meter Tests

By M. E. SHOTWELL
Twin Falls, Idaho

With a light-sensitive device developed by the author for standardizing watt-hour meters experiment has shown that it is possible to test and



Tests new meters in 5¼ minutes

adjust a meter converted to the socket type every 7½ minutes and to test and number a new meter every 5¼ minutes.

Generally stated, the device comprises a system for automatically counting the revolutions of the watt-hour meter disk without making any changes in the meter. The device, known as the Shotwell "Reflecto" meter tester has proved very satisfactory in standardizing converted meters on full and light load. Accuracy of the device makes it possible to make close adjustments on both full and light loads with one revolution of the meter disk for each load, thereby saving considerable time. It is, however, possible to set the apparatus for any desired number of revolutions of the meter disk from one to twenty.

In use it is necessary only to mount the meter on the test board, apply

IF YOU OPERATE 5000 VOLTS OR MORE - - -

See **Page after Page of New Time and Money-Saving**

HOT LINE TOOLS *and* ACCESSORIES

THE NEW Kearney Bulletin 331 is a popular and instructive guide to safe, economical purchasing of Live Line Tools and Equipment . . . It gives cost comparison studies which show the effective handling of jobs hot . . . It lists, illustrates and describes more than a hundred outstanding items of the popular Kearney line — every item a scientifically developed and proven product — many of them exclusive Kearney developments.

You'll find this new Kearney Bulletin close at the right hand of the most alert purchasing agents and engineers throughout the Industry . . . You'll find wide-awake maintenance crews studying Section A of this bulletin which solves twenty-two hot line jobs on various constructions.

Really, you need the Kearney Bulletin 331 to help you save time and money . . . Check your files to see if this comprehensive catalog has reached you . . . If it hasn't — write.

AN INTERESTING AND PROFITABLE ARTICLE IN YOUR NOVEMBER Hi-LINES

ON YOUR DESK BY THE 25TH OF EACH MONTH

JAMES R. KEARNEY CORPORATION

DESIGNERS AND MANUFACTURERS OF OVERHEAD AND UNDERGROUND

UTILITY EQUIPMENT

4224-42 CLAYTON AVENUE SAINT LOUIS, MO.

the desired load to the meter, set the Shotwell "Reflecto" meter tester for the desired number of turns of the meter disk and press a key, whereupon the apparatus goes to work testing the meter. When the key is pressed the testing device automatically closes the potential circuit of the standard meter. After the disk has made the predetermined number of revolutions the testing device automatically opens the standard meter potential circuit. The man operating the tester can then check the readings and make any necessary adjustments. When the apparatus is set in motion it will operate unattended, thereby permitting a man doing the testing to attend to filling out meter records or any other duties required of him. Accuracy of the device has been checked repeatedly and found to be 100 per cent.

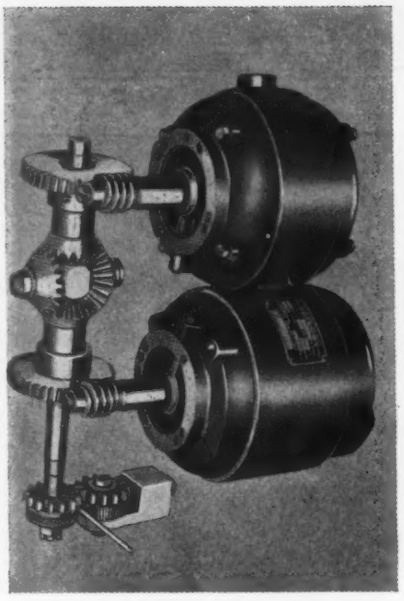
•

Double Motor Control Of Welding Rod Feed

Electrode feed directly proportional to arc voltage and welding rod consumption is provided by an ingenious control for automatic arc welders developed jointly by the Ohio Electric Company and Una Welding, Inc., Cleveland, Ohio.

The scheme employs two fractional horsepower motors geared together by a differential on the feed mechanism shaft of the controlled machine. The larger of the two motors, a separately excited d.c. machine, tends to feed the welding rod down against the work and is connected electrically between the electrode and work. The smaller motor, a constant speed a.c. machine, tends to pull the electrode up and is controlled by a relay in series with the welding current circuit.

When the welding machine is started the "down" motor receives full open circuit welding voltage (cut down by means of tapped resistances to 20-40 volts). It therefore feeds the rod down until it touches the work. Being now practically short circuited, the down motor is de-energized—excessive current being prevented by a series rheostat used for pre-setting arc length. The rush of welding current operates the relay energizing the "up" motor, instantly pulling the electrode rod away from the work and striking the arc. With



Double motor differential control provides automatic electrode feed for metallic arc welding head

the arc established both motors continue to run; the rate of electrode feed being proportional to the difference in motor speeds, which is in turn directly proportional to the voltage of the arc and the rate at which the rod is consumed. This automatically takes care of any irregularities in welding conditions which may occur as the work progresses.

•

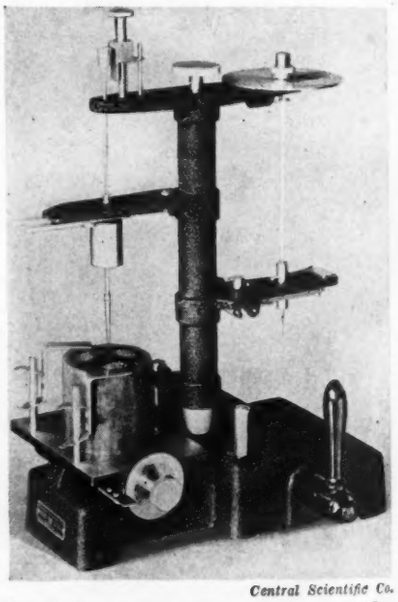
Cable Insulation Compactness Tester

Efforts to improve the mechanical uniformity and therefore the quality of solid-type, high-voltage, underground, power transmission cable, has focused the attention of both users and manufacturers on means for evaluating compactness of laminated insulation and density of filler spaces. The illustrated "Insulation Compactness Tester" is a combination instrument developed from instruments devised by the Detroit Edison Company for measuring compactness and uniformity of cable insulation, by means of torsion and penetration tests.†

Preparation of cross sectional wafers of styrene-impregnated cable* for examination over a strong light provides an effective method for detecting mechanical irregularities in cable insulation and precise measurement of the layer structure may be made with a measuring microscope, but much additional information may be gained, it is said, by the more quantitative torsion and penetration tests.

The torsion test measures the compactness of the insulation layer structure in terms of the force required to twist a small flat probe, inserted a definite length between insulation layers, through a small angle. The force, naturally, is greater for compact than loose insulation. Readings taken at intervals across the insulation from conductor to sheath will show the variations in compactness across the insulation wall.

General compactness of insulation or density of filler space is determined by the penetration test. Measurements are made of the depth of penetration of a special sharp-pointed needle which is driven into the insulation by a force of a constant



Central Scientific Co.

Insulation compactness tester provides means for measuring mechanical uniformity of cable insulation

Instrument combines torsion and penetration test facilities. Shown here with penetration tester in place over cable specimen.

magnitude. Although the test is said to be useful for making rough comparisons of compactness of different insulations, it is declared to be most valuable for determining the density of filler spaces. This is an important factor in compound migration, in cable laid on slopes and in the behavior of cable during load cycle aging and use.

* See Electrical World, Dec. 4, 1937—"Microtomic Wafers Reveal Cable Voids," by Wyatt, Smart and Reynar.

† See Electrical Engineering, March, 1938—"Mechanical Uniformity of Paper-Insulated Cables," by Wyatt, Smart and Keynar.

SO SAYS:—*Mr. Arthur Holmes, Chief Electrician, Ingersoll Milling Machine Co., Rockford, Ill.* "Shutdowns were occurring an average of five times weekly on temporary starting loads on a grinder powered by a 20 H.P., 220 V. three phase squirrel cage motor fused with ordinary renewable fuses of 100 amp. capacity.

"Severe production penalties due thereto caused me to install 100 amp. BUSS SUPER-LAG FUSES, along about the first of this year, and to date we haven't had a single fuse blow on this circuit.

"Not only have we disposed of the annoyance and expense entailed by the former situation but we were saved the cost of installing a larger sized switch, with larger fuses, which surely would have been necessary had we continued with ordinary fuses."

Avoiding Installation Costs Is Only a Part of the Savings Buss Fuses Can Make in Your Plant

The big saving with BUSS Super-Lag Fuses comes from the elimination of needless blows with their resultant costly shutdowns.

Prevention of needless blows is accomplished thru two scientifically worked out features:—

1. The design of the FUSE-CASE is such that it guards the fuse link against possible injury while renewing the fuse—and it MAKES and MAINTAINS good contact on the fuse link.

Given good contact in the clips, a BUSS fuse will carry continuously its full rating. Users are not annoyed by fuses blowing because of faulty design.

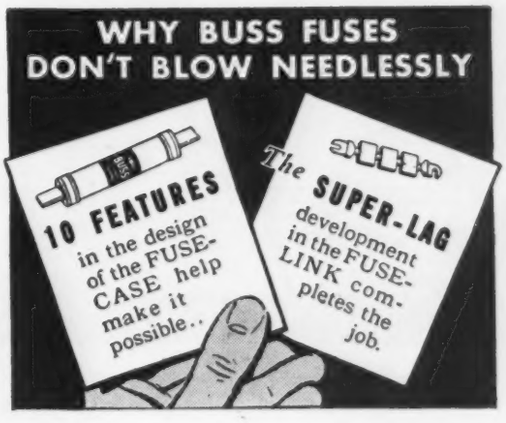
2. The Super-Lag development in the FUSE-LINK gives BUSS fuses a time-lag sufficient to hold harmless overloads such as those caused by two or more motors starting simultaneously or a machine not getting up to speed quickly or other such common condition.

With BUSS Super-Lag fuses the circuit is not shut down needlessly—useless shutdowns that cause machines and workers to stand idle are avoided.

For a comparison of the BUSS design with others ask for a free copy of the "Rb" book—or better still...

Give your plant this low cost protection, by passing the word down the line that all purchase orders and requisitions must call for BUSS Super-Lag Fuses.

BUSSMANN MFG. CO.
UNIVERSITY AT JEFFERSON
ST. LOUIS, MO.
Division of McGraw Electric Company


WHY BUSS FUSES
DON'T BLOW NEEDLESSLY
10 FEATURES
in the design of the FUSE-CASE help make it possible..
The SUPER-LAG
development in the FUSE-LINK completes the job.

BUSS *Super Lag* FUSE

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

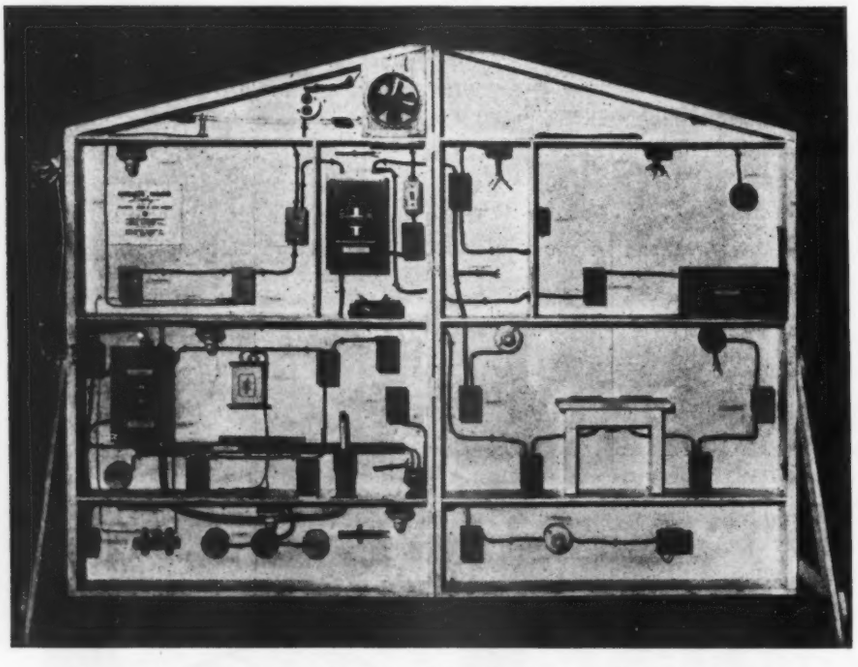
Mississippi Power Uses Wiring Model

An effective way of merchandising the subject of adequate wiring was found by the Mississippi Power & Light Company in connection with a series of cooking schools held in nineteen cities in the state over a period of seven weeks.

A wiring display was rigged up (see illustration) to represent the cross-section of a two-story house from attic to basement. This display was set up at each of the cooking schools and attracted more attention than anything else. Men and women alike, attracted by its novel appearance, enjoyed operating the door chimes, pilot switches, attic fan and new type circuit breakers, not to mention other fixtures.

"The display dispelled all our fears of being too technical for the average housewife," said R. S. McFarlane of the sales promotion department, who designed the board. "We found women intensely interested in the subject of lighting and willing to talk about cables, circuits, load centers, etc."

The display is so efficiently designed that it weighs only 232 lb. and can be carried by two men and set up as a window display or on the sales floor to permit close inspection. The Cabell Electric Company of Jackson furnished the some $80 worth of wiring devices and equipment for the board free of charge and the wiring was done by the Martin Electric Company of Jackson. Cost of building the board, exclusive of wiring, was about $20.



Adequate wiring display shown by Mississippi Power & Light Company at various cooking schools over the state

According to Mr. McFarlane, designer of the board, it successfully dramatizes the following:

1. How circuit breakers may replace the use of fused switches and distribution panels and the need of load centers with radial wiring systems.
2. How new simplified wiring plans using covered neutral cable may be used to effect advantageous savings in wiring costs and how simple it is to use CNX cable in wiring homes.
3. The need of specifying in contracts that safe, dependable and adequate amperage switches be used.
4. The convenience and simplicity of three- and four-way switches.
5. The convenience and economy of pilot light switches to act as a "telltale" when basement or closet light is not cut off.
6. The availability of different kinds of devices with various color schemes in switch plates and convenience outlet plates.
7. The convenience and economy of using the electric range convenience outlet receptacle, especially in apartments and homes built to rent or wherever ranges are to be installed.
8. The convenience of the "plug-in-strip," especially in the average kitchen, where numerous appliances crowd the duplex receptacles, and for use in baseboards of the more expensively wired homes.
9. The installation of an attic fan and how simple and easy it is to install with a delay or mark-time switch and overload protection device.
10. How the bimetal strip of the circuit breaker works and how simple it is to reset after a protective operation. (The Square D cutaway display breaker is always a source of interest.)

The left-hand side or entrance control side of the completed display can be energized by connecting the three wire, No. 6 entrance cable with a temporary 110/220-volt, three-wire service connection and all switches and outlets including the range outlet will operate properly. An electric range may be serviced through the display if desired. The right-hand

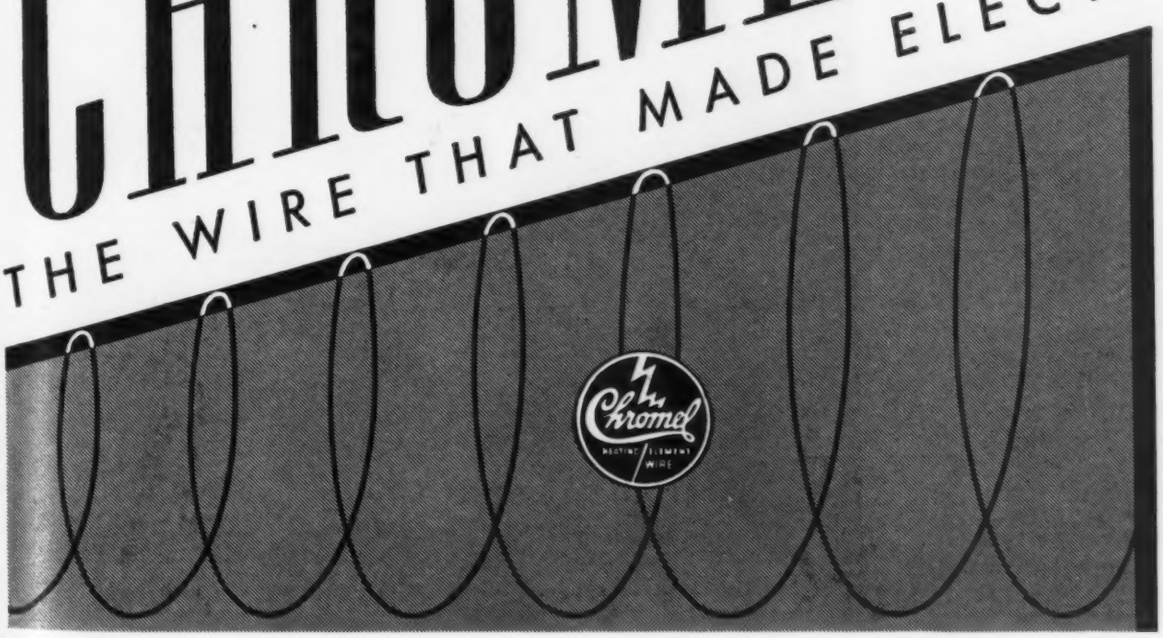
RELIABLE PERFORMANCE

Whether you make heating appliances, or sell them, or sell the power to operate them, you are assured that when the heating elements are made of Chromel, they'll give a reliable performance. It's to your own advantage to specify Chromel for your heating elements. And remember, that into Chromel, go 30 years of manufacturing experience.

HOSKINS MANUFACTURING COMPANY • DETROIT • MICHIGAN

CHROMEL HEATING ELEMENT WIRE

THE WIRE THAT MADE ELECTRIC HEAT POSSIBLE



side of the display is not connected up and outlet boxes are left open for inspection.

•

Refrigerator Tests Average 19 Kw.-Hr.

That an electric refrigerator can and will pay for itself, often within the first year, is one of the many important findings recently proved by the operation of more than 102 "proving kitchens" established by Westinghouse. This proof of economy, testified and sworn before a notary public by the homemakers themselves, also indicated that the cost of operating the average Westinghouse refrigerator, under normal use, varied from 60 to 80 cents a month, depending upon the local rates.

These home-proving kitchens determined exactly what happened after the refrigerators were sold to the purchaser. Homes of various types were chosen, varying in the number of people in the family, the approximate income and the size of the refrigerator. A simple test panel which would record the current consumption, operating time, temperatures of the kitchen, milk compartment and food compartment was developed to facilitate keeping complete accurate figures. This, together with an automatic door-opening counter, and a record form, was all that was needed to perform the home-proving test.

In 1938 this kitchen-proving activity was continued and now there are more than two thousand home-proving kitchens located in every section of the U. S. and in foreign countries of different climatic conditions.

Facts and figures about electric refrigerators obtained from the proving kitchens are most enlightening for sales analysis as well as being of equal general interest. The results compiled show that the average number of persons in the family is slightly above four, closely approximating the national average, and that the average monthly food expenditure was $54. After the average saving of $10.88 a month (the reported average saving on food) is deducted the average food expenditure a month per family amounts to $43.12. In addition to the saving on food, the proving kitchens reported an average monthly saving of $2.40 on operating expenses over previous methods of refrigeration. This means that the careful estimates of all hostesses conducting the 1938 tests reflects an average saving of $160.68 per year by using an electric refrigerator.

Operating cost of the kitchen proving refrigerators avered 63 cents per month. This average was obtained from the given electric rate of 3½ cents per kilowatt-hour, which is slightly below the national rate. It would be only fair thus to state definitely that the cost to operate a Westinghouse electric refrigerator would be somewhere between 60 and 80 cents, depending upon the local electric rate. The average current consumption of the refrigerator was 18.9 kw.-hr. per month and the average running time was 11.1 per cent, or out of every twelve hours the actual running time of the mechanism is only 1⅓ hours. This means that at the end of a long period of perfect refrigeration the mechanism is still far from worn out, having operated only 11 per cent of the time.

•

Boston Adds 23 Kw. per Man-Month

By R. B. BROWN, Jr.
Illuminating Engineer,
Boston Edison Company.

Continuous and persistent study of the territory, combined with recommendations for modernized illumination based on engineering analyses, is responsible for this branch of Boston Edison sales accomplishments from year to year. Improvements in lamps, fixtures and wiring, together with rates favorable to the increasing use of electricity for commercial lighting applications, have raised the standards of practice far above old-time levels. Intensities of 15 to 40 ft.-candles are accepted, even demanded today, by customers who wish to take advantage of the best the art has to offer the store, office, bank and many other users of service.

In 1937 the increase in connected lighting load on this system was 23 kw. per man-month of sales effort, compared with 19.8 the year before. This was the best figure thus far obtained, and the increase in revenue per man-month was equalled only in 1931. This was $1,516 in 1937. Last year 296 commercial lighting installations were made, increasing our connected load by 1,022 kw., and yielding an estimated increase in annual revenue of $65,850. The nearest approach was by our electric sign section, which had 427 installations, aggregating 646 kw., and yielding about $58,140 in revenue.

There has been a general upward swing in lighting standards. Depressed business conditions seem to have little effect on these standards, and the trend toward higher values continues with the current indications of reviving business. Our recommendations last year embraced more than a quarter of a million dollars worth of lighting material and equipment. Office lighting improvements were outstanding, accounting for 158 installations aggregating 569 added kw., with increased revenue of $34,140, and 138 store installations of 453 added kw., and $31,140 revenue.

Boston Edison supplies this neon and incandescent sign and marquee load totaling 4.85 kw.

The Weaver of Tarbert ...

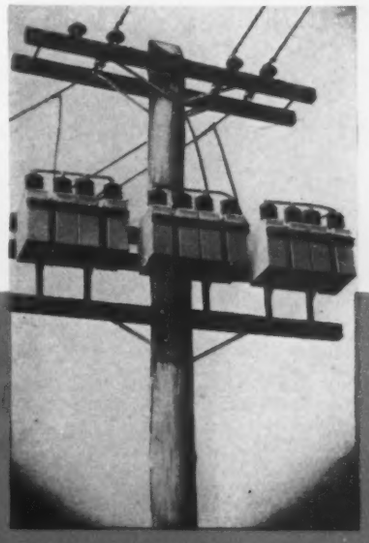
AND THE CAPACITORS YOU BUY FOR POWER FACTOR CORRECTION

A HIGHLAND sun streams down on his wizened face. To his cottage in Tarbert on the Isle of Harris come buyers from the great tweed mills of Glasgow, Hawick, Innerleithen.

For this bonny Scotsman, this weaver from the outer Hebrides, is a *specialist*. He knows little of the world beyond the Cheviot Hills, yet in every land men know of his master craftsmanship. Know his hand-woven tweeds —tweeds with the bloom of heather and the good smell of peat on them—as the finest in all the world.

To the canny buyer of industrial equipment, there is strong appeal in C-Ds' proved longer life. This is the result of capacitor *specialization*. For more than a quarter century, Cornell-Dubilier has concentrated its entire efforts in the manufacture of capacitors. *C-D economy —they cost less in the long run,* added to *C-D dependability—they live longer,* can mean only one thing — you get more capacitor value per dollar when you specify C-Ds. Let us prove it to you.

Complete details on request. Cornell-Dubilier Electric Corp., 1032 Hamilton Blvd., So. Plainfield, N. J. Canadian representatives, English Electric Co. of Canada, Ltd., St. Catherine, Ontario.



A bank of C-D pole-type units totalling 180 kv-a. capacity at 2300 volts, 3-phase, 60 cycles.

World's largest manufacturers of capacitors.

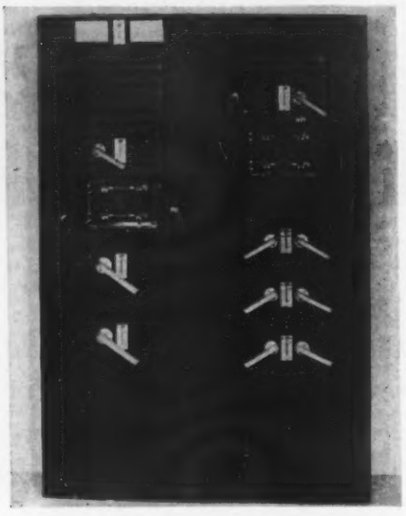
CORNELL-DUBILIER

Capacitors for Power-Factor Correction

New EQUIPMENT AVAILABLE

New Switchboards

To replace banked safety switch installations, this company has brought out these switchboards, made up of standard-



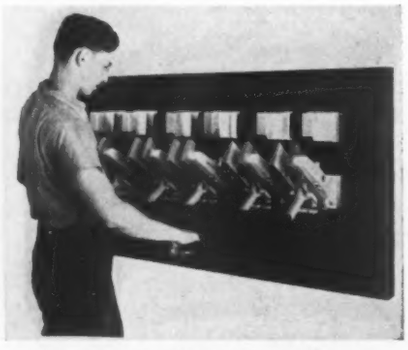
"Vacu-Break" switchboards; capacities, two- and three-pole, 30 to 600 amp., 600 volts and less. **Bull Dog Electric Products Co.,** Detroit, Mich.

ized units, with front-operated switches. The boards are suitable for wall-mounting and provision is made for the addition of future circuits. "Vacu-Break" switch units are used, the circuits being horsepower rated, so the switchboard may be used not only as a disconnect but also as an operating type distribution center.

•

Disconnect Switch

This hand-operated, three-pole, 10,000-amp. disconnect switch is so constructed that all three poles are opened or closed in unison, constituting, in effect, the opening or closing of a 30,000-amp., single-pole switch.

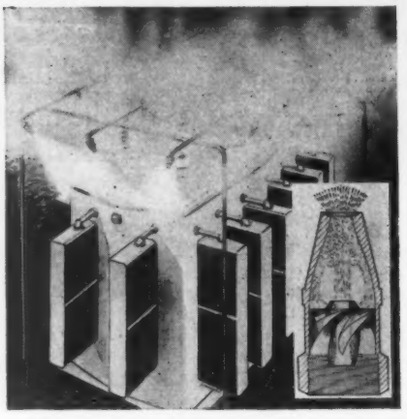


"Klamp-Tite" switch, three-pole, hand-operated, 10,000 amp., 250 volts d.c. **I-T-E Circuit Breaker Co.,** Philadelphia, Pa.

•

Fire Protection

The use of water in fighting outdoor electrical equipment fires has gained new approval with the development of apparatus which breaks up the stream of water from a hose into finely divided spray. In this newest development, a central solid jet of water meets a twisting, converging current of water to form a uniformly solid cone of finely divided spray—acting, in effect, somewhat like a heavy rain. Applied in this fashion, the water cools the burning liquid—in the case of oil-insulated transformers—below the flash point, while the steam formed excludes the air necessary to support combustion.



"Fire-Fog" nozzle, shown in cross-section at lower right; application of system to outdoor oil-insulated transformer suggested by sketch. **Walter Kidde Co.,** 140 Cedar St., New York, N. Y.

•

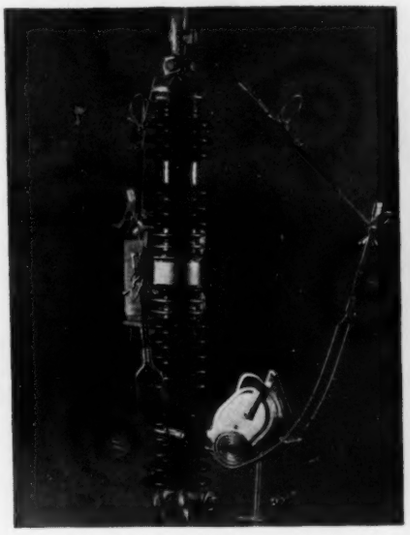
New Welders

"Model 6WK13B2" arc-welding transformer; 60 cycles, 150 amp., 220 to 80/100 volts; d.c. welder, rated 150 amp. at 25 volts, welding range, 20 to 200 amp. **General Electric Co.,** Schenectady, N. Y.

Two recent welding developments of this company for light-gage work include a 150-amp. a.c. arc welder of the transformer type and 150-amp. d.c., single-operator arc-welding equipment. The a.c. welder makes use of the new fibre-glass insulation and is intended for low-current welding with the heavy-coated electrodes. Continuous, stepless control is provided by a hand crank. In the d.c. model a three-point switch and dial for intermediate adjustment is provided for control of the current range. This company has also recently developed a thyratron-controlled automatic welding head.

Reclosing Fuse Switch

Equipped with a kinetic energy train or geared flywheel, which causes a time delay of approximately 50 cycles between re-



"Trip-O-Link Trip-Saver" reclosing fuse switch; 15 kv., 50 amp. **James R. Kearney Corp.,** St. Louis, Mo.

closings, this fuse switch is offered for service in clearing temporary outages, thus helping to improve service continuity.

•

Intermediate Size Clamp

To accommodate the middle range of conductor sizes, those ranging in diameter from $\frac{3}{16}$ to $\frac{7}{16}$ in., this company has brought out an intermediate universal strain clamp. Having a reversible keeper piece, it will take any standard conductors from 8A to 2A Copperweld, from No. 4 to 3/0 solid copper, from No. 5 to

Intermediate universal strain clamp; rated ultimate strength, 10,000 lb. **Ohio Brass Co.,** Mansfield, Ohio.

Whatever Your Truck Needs, INTERNATIONAL Can Fill Them

The popular 1½-ton International Model D-30 Truck working near Gary, Ind., for the Chicago, South Shore and South Bend R. R. Co.

If you are looking for a half-ton pick-up truck, a big six-wheeler, or *any size between,* you will find in the International line the one that exactly fits your job. There are 30 models in 99 wheelbase lengths to choose from.

Every Truck in the line is ALL-TRUCK all the way through—backed by International's more than 30 years of TRUCK-manufacturing experience. And the nation-wide International service organization stands behind these trucks, providing low-cost, factory-standard service at all times.

Inspect these Internationals at the nearby International dealer or Company-owned branch showroom. Check International Trucks against your requirements and be assured of complete satisfaction.

INTERNATIONAL HARVESTER COMPANY
(Incorporated)
180 North Michigan Avenue Chicago, Illinois

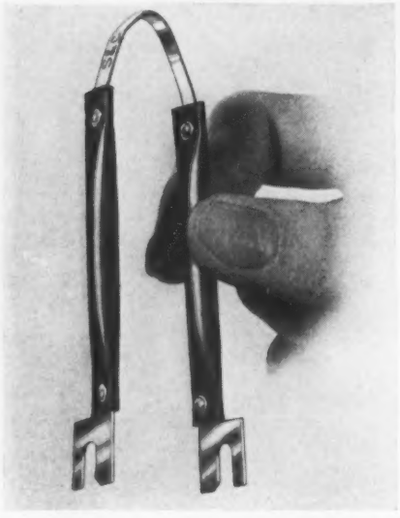
INTERNATIONAL TRUCKS

2/0 stranded copper and from No. 6 to No. 2 A.C.S.R. It is said to be particularly adapted for use with high-strength No. 2 and No. 4 A.C.S.R. having one steel and seven aluminum strands.

•

Plug Type Fuse Links

New fuse links for plug-type cutouts provide for two gaps in series following the blowing of the fuse, thus increasing the dielectric strength of the cutout assembly. Greater resistance to corrosion is



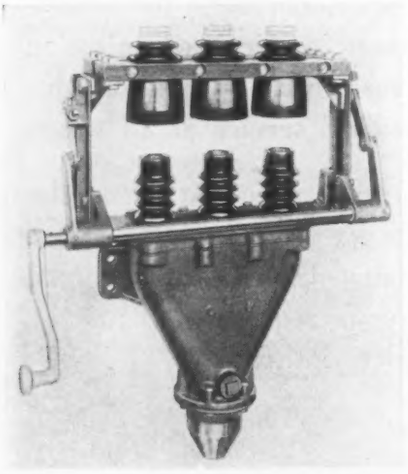
Plug-type fuse links; in capacities of 3, 5, 10, 15 and 25 amp. **Schweitzer & Conrad, Inc.,** Chicago, Ill.

gained by tinning the copper terminals. Short-circuit interrupting capacity of the cutout is increased and links reduce the tendency to set up an arc between the cutout terminals by directing the arc gases upward.

•

Disconnecting Potheads

By attaching a simple gang-operating device to this company's type "ES" disconnecting potheads, provision is made



Type "GES" pothead; 5 and 7 kv. **G & W Electric Specialty Co.,** Chicago, Ill.

for quick and safe disconnection of a cable at its terminal. Mechanism locks automatically past dead center when in the open position and the handle can be arranged for operating a pole-top pothead from the ground. These potheads use non-sticking plug and socket connectors.

Utility Line Body

Crew cab and body of this new public utility line body are separate, but joined by a flexible concealed connection. Full

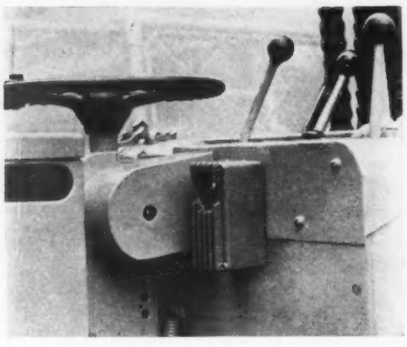
"Unitary" body, mounted on cab-over-engine chassis. **Baker-Raulang Co.,** Cleveland, Ohio.

crews up to nine men may be accommodated in the cab, it is claimed; distortion and body wrack resulting from operation of derricks and use over rough roads and uneven ground is said to be eliminated. Derrick ladder and pikes are inclosed.

•

Battery Discharge Indicator

New discharge indicator for electric industrial trucks warns the operator when the battery is approaching a discharged condition and should be changed or re-



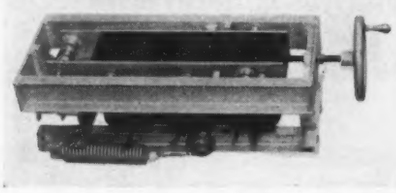
"Exide" discharge indicator. **Electric Storage Battery Co.,** Philadelphia, Pa.

charged, thus cutting down on time-consuming "tow-ins." Warning is in the form of a red light; at first there are only momentary flashes, with the light going out when the truck reaches full speed. With each run, as the battery discharges, the light remains on for a longer time, finally staying on all the time the truck is running.

•

Voltage Control

Continuously variable polyphase reactors are announced for industrial applications where a smooth, continuous control of polyphase power is wanted. Standard parts are available for a number of sizes and the manufacturer offers engineering and production facilities in applying this



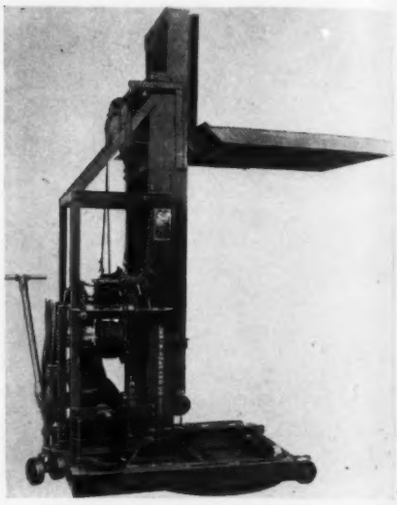
Continuous voltage control for polyphase a.c.; unit shown develops a drop of 300 volts at 50 amp. per coil. **Raytheon Mfg. Co.,** Waltham, Mass.

reactor to electrical machinery, furnaces and testing equipment. Biasing springs are used to reduce vibration and noise.

•

Telescopic Stacker

To provide greater maneuverability, this new stacker or portable elevator is constructed so that it may be turned at right angles to its own length. Base construction includes retractable travel wheels and circular plate supporting four rotating wheels mounted in stationary position in



"PBRT 1923;" will lift load of 1,500 lb.; platform may be lowered to 8½ in. from floor, raised to 133 in.; powered with 3-hp. motor, 220 volts, three phase, 60 cycles; lifting speed, 34 ft. per minute. **Lewis-Shepard Sales Corp.,** Watertown, Mass.

the base. Machine is moved along the floor with its regular travel wheels, which are then retracted, allowing the weight of the stacker to be transferred to plate and the complete unit rotated.

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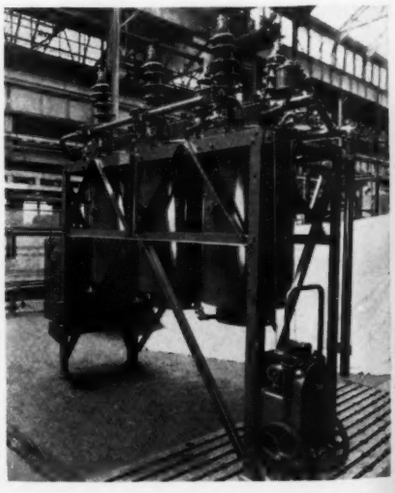
Tank Lifter

New portable motor-operated tank lifter is designed to simplify the task of raising and lowering oil tanks of outdoor circuit



Portable motor-operated tank lifter; shown in position for lowering first tank. **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

breakers. Small motor and reduction gearing were applied to a lifter ordinarily used as a hand-operated device, the combination mounted on wheels and a handle provided for mobility.

AMCRECO
FULL LENGTH PRESSURE TREATED
POLES

Assure satisfaction to the end of the line

WHEN AmCreCo poles carry your electric line, you are assured of: Economy and Trouble-Free Service.

Their economy is found in an unusually long life with low maintenance cost. The continuous service advantage which AmCreCo poles give to a line is reflected in your customer's satisfaction as well as your own. It is important that you accomplish this—from your end of the line down to the users.

AmCreCo full length, pressure treated poles make this certain.

Inquire about their extra quality.

AMERICAN CREOSOTING COMPANY

AMCRECO
Full length
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AMERICA

MODERN LINE CONSTRUCTION
demands the high Quality of
AMCRECO FULL LENGTH PRESSURE TREATED POLES

ESTIMATED profits can only be realized on present day electrification projects if poles are carried by "quality" poles. It is necessary to take advantage of every possible economy in maintenance expense and line outage.

AmCreCo full length pressure creosoted poles assure complete pole satisfaction. They have an admirable reputation of low up-keep cost and long service which contributes greatly to the economical operation of every line. Because of these outstanding advantages AmCreCo poles have become standard in electrical development where good poles are recognized. Information or tests

AMERICAN CREOSOTING COMPANY

AMCRECO
FULL LENGTH PRESSURE TREATED
POLES

SERVICE interruptions cause a loss in revenue and good will. For more than 30 years, AmCreCo Pressure Creosoted Pine Poles have helped insure customer satisfaction by maintaining line security. High initial strength is retained long after the line has earned its retirement.

An unusual length of serviceable life is expected from AmCreCo poles. Why? Because their reputation has been built on such service. All creosoted poles are not backed by a line reputation—so, when poles are considered, make sure your choice is sound. Ask to consult an AmCreCo engineer.

AMERICAN CREOSOTING COMPANY

For
DEPENDABLE, LOW COST LINES!

MCRECO
length
treated
ES

REOSOTING COMPANY

AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY INCORPORATED

AMCRECO LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY INCORPORATED

ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

News ABOUT PEOPLE

H. B. Bryans Assumes Duties as Executive Vice-President

Henry B. Bryans, who was recently elected executive vice-president of the Philadelphia Electric Company, has been identified with the operation and

management of electric and gas utilities for many years. He has been with the Philadelphia utility since 1928, at first in the capacity of assistant general manager and since 1929 as vice-president in charge of operations.

Following graduation from the University of Pennsylvania, Mr. Bryans was connected with the Philadelphia Gas Works and with the Kansas City (Mo.) Gas Company. After varied experience he returned to Philadelphia, where he inspected and appraised electric and gas properties for the United Gas Improvement Company. In 1914 he was appointed engineer of the Counties Gas & Electric Company at Norristown, where his principal attention was directed to developing electrical facilities in line with the notable expansion then characteristic of the industry as a whole. At the same time he carried on various other engineering, operating and sales activities. In 1927 he was made general superintendent of the Philadelphia Suburban-Counties Gas & Electric Company and in the following year was promoted to assistant general manager of the same company. His connection with Philadelphia Electric followed.

Mr. Bryans is a past-president of the Pennsylvania Electric Association and is a member of the American Institute of Electrical Engineers.

•

▶ ROBERT S. THURSTON, head of the sales engineering section of the General Electric air-conditioning department for the past five years, has resigned to become general manager of the General Air Conditioning Company, G. E. distributor in Memphis, Tenn. Mr. Thurston has been associated with General Electric's air-conditioning activity from the beginning.

•

Westinghouse Names Rodgers Eastern Engineering Manager

W. H. Rodgers has been appointed engineering manager of the eastern district of the Westinghouse Electric & Manufacturing Company to succeed R. E. Powers, who has been appointed northwestern district service manager.

After graduating from the University of Illinois in 1922, Mr. Rodgers entered the central station engineering section of the Westinghouse Electric & Manu-

facturing Company, and for nearly fifteen years, until his present appointment, worked on electrical supply and distribution problems.

Kelvinator Appoints Stuart to Direct Sales Promotion

J. Nelson Stuart, until recently advertising and sales promotion manager of the Delaware, Lackawanna & Western Coal Company, has been appointed

director of advertising and sales promotion of the Kelvinator division of Nash-Kelvinator Corporation, with headquarters in Detroit.

During his association with the coal company, Mr. Stuart devoted considerable attention to public relations. He was responsible for the introduction of the sound slide film for the training of retail personnel and the inauguration of a radio chain broadcast. He also set up training classes for the purpose of teaching retail fuel employees the fundamentals of dealing with customers. He inaugurated and personally conducted the industry's first series of dramatized conventions.

Prior to his association with the Delaware, Lackawanna & Western Coal Company Mr. Stuart was with the American Signs Corporation, Kalamazoo, Mich., as national accounts sales manager.

•

▶ BERNARD S. RODEY, JR., chairman of the general accounting committee of the Edison Electric Institute, has received the degree of Doctor of Juri-

• *Before you "dig" for "distribution"*

Orangeburg Catalog No. 45 contains some helpful tables and detailing data. Orangeburg sales agents, The Graybar Electric Co. and the General Electric Supply Corp. are equipped to give you helpful assistance.

For duct banks, main distribution, high tension and "downtown" underground we recommend Orangeburg Standard Fibre Conduit *with* concrete encasement.

Complete and permanent cable protection and raceway facilities combine with immediate savings for the ultimate economy of substantial capital investment.

Orangeburg is not just-fibre-conduit- but is THE fibre conduit proven by 45 years of use.

ORANGEBURG* *Standard* FIBRE CONDUIT for use Underground WITH Concrete Encasement

Only
The Fibre Conduit Company
Makes
ORANGEBURG
(Trademark Reg. U. S. Pat. Off.)
Since 1893

Now
ORANGEBURG
*NOCRETE the new Dual Economy CONDUIT

For use underground WITHOUT Concrete encasement

For service entrances, extensions, parkways and street lighting, suburban runs, laterals, etc., we recommend consideration of Orangeburg NOCRETE made for installation *without* concrete encasement.

Its cost is about 50% that of metal pipe and less than non-metallic conduits of any comparable quality. Installation costs are much lower, it is easier to handle, to cut or tool altho its strength is far in excess of any fibre conduit produced heretofore.

It is immune to soil corrosion and electrolysis.

Where good engineering practice permits the use of a conduit *without* concrete encasement, Orangeburg NOCRETE offers real savings in both initial material and installation costs combined with exactly the same permanent cable protection qualities that distinguish Orangeburg Standard.

THE FIBRE CONDUIT COMPANY — **Sales Office 292 MADISON AVENUE, N. Y.**

Sales *Agent* GENERAL ELECTRIC SUPPLY CORP. — **Sales *Agent* GRAYBAR ELECTRIC COMPANY, INC.**

* Trademarks—"Orangeburg" & "NOCRETE" registered U. S. Pat. Office.

dical Science, after writing a thesis of particular interest to the electrical industry. This thesis is entitled "The Lay Meaning and Legal Significance of the Terms 'Original Cost' and 'Prudent Investment'" and includes "A New Plan to Settle a Fifty-Year-Old Problem."

•

Georgia Power Transfers Division Superintendents

Transfer of Columbus, Macon, Rome and Augusta superintendents to new divisions has been announced by W. E. Mitchell, vice-president and general manager of the Georgia Power Company.

The changes are as follows: L. E. Anderson, of Columbus, to superintendent of the Rome division; W. L. Westbrook, of Macon, to superintendent of Columbus division; M. H. Hummel, of Rome to superintendent of Augusta division, and C. W. Roberts, of Augusta, to superintendent of Macon division.

Joining the old Augusta-Aiken company in 1904, Mr. Hummel was made Augusta division superintendent in 1929 and early in 1931 was transferred to Rome in the same capacity. Mr. Westbrook joined the company in 1919, became Columbus division superintendent in 1930 and in 1934 was transferred to Macon as division superintendent. Starting with the company as a transmission engineer in 1923, Mr. Anderson held various engineering positions until 1934, when he was assigned to the Columbus division as assistant superintendent. In 1936 he became Columbus division superintendent. Mr. Roberts joined the company as an engineer in 1929; subsequently was made assistant division superintendent at Augusta and in 1936 was made Augusta division superintendent.

•

▶ WILLIAM B. CARNIE, formerly senior system operator, Montaup Electric Company, Fall River, Mass., has been appointed chief operator and electrical engineer, succeeding the late S. Clifford Jacoby.

▶ HERMAN R. LARSON has been appointed central district service manager, Westinghouse Electric & Manufacturing Company, with headquarters at the Homewood Works. Before joining the Westinghouse company in 1919 he was associated with the Tacoma Railway & Power Company and the Puget Sound Electric Railway Company. With the exception of one year, 1920, when he was located in the generator test division, Mr. Larson has been continuously in the service department.

J. F. O'Brien Resigns From Westinghouse Lamp

J. F. O'Brien, manager of the advertising, sales promotion and publicity departments of the Westinghouse lamp division, Westinghouse Electric & Manufacturing Company, and a director of the company's New York World's Fair exhibit, has resigned.

As advertising and sales promotion manager, Mr. O'Brien is widely known for the many successful advertising and sales promotion plans conducted by the Westinghouse lamp division for public utilities, electrical dealers and chain stores. He is an authority on fairs, trade shows and exhibits and has established

a national reputation as a writer and speaker on lighting, wiring, the application of electricity to modern living and merchandising. Mr. O'Brien joined Westinghouse Lamp Company in 1920.

He was one of the founders of the National Better Light-Better Sight Bureau and since its inception he has been a member of the executive committee. As a member of the plan committee of the National Adequate Wiring Bureau he played an active part in its organization.

In 1935 Mr. O'Brien was awarded a certificate of honorable mention in competition for the James H. McGraw Award for co-operation for his outstanding contribution to the advancement of the electrical industry in the development of a technique for promoting the conservation of eyesight through the Better Light-Better Sight campaign. He is a member of the Illuminating Engineering Society, Association of National Advertisers, Public Utilities Advertising Association, Electrical and Gas Association of New York and other organizations.

•

▶ GEORGE G. POST, a vice-president of the Milwaukee Electric Railway & Light Company, has been elected president of the Engineers' Society of Milwaukee.

OBITUARY

▶ KARL W. NELSON, sales manager of the plastics department of the General Electric Company, and formerly manager of the company's automotive products sales section, died suddenly in Pittsfield, Mass., October 16. He was 35 years of age.

▶ CHARLES H. HARRIS, general engineer of the Virginia Electric & Power Company, Richmond, Va., died October 22 at his home in that city. He was 60 years old.

▶ GUSTAF A. BERG, "Glyptal" sales specialist in the appliance and merchandise department of the General Electric Company, Bridgeport, Conn., died suddenly, of a heart attack, October 18 at his home in Monroe, Conn. He was 44 years old.

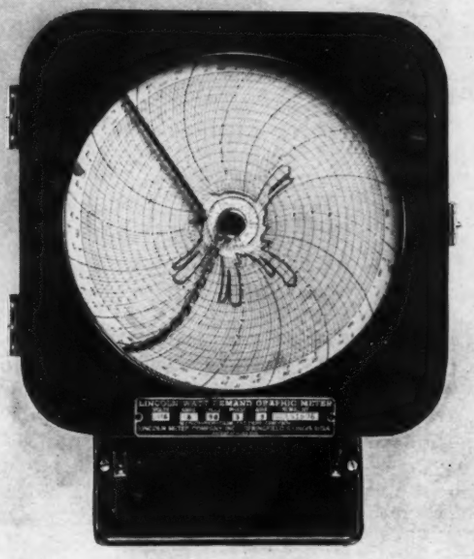
▶ JAMES WALLACE died, of pneumonia, October 26 in the North Country Community Hospital, Glen Cove, Long Island, as the result of remaining on duty eighteen hours in the Glenwood power plant of the Long Island Lighting Company after the plant was flooded by the tidal wave in the September 21 hurricane. He first became ill of a cold, which developed into pneumonia. Mr. Wallace, who was 51 years old, had been employed at the power plant for the past twenty years.

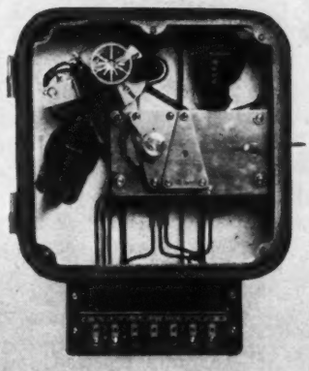
▶ S. CLIFFORD JACOBY, superintendent of system operation and electrical engineer of the Montaup Electric Company, Fall River, Mass., died in that city October 20, after several months of poor health. He was 41 years of age. Mr. Jacoby held his late position since 1925, when the Montaup jointly owned system became prominent in New England utility affairs. He was a member of the American Institute of Electrical Engineers, Providence Engineering Society and a past-secretary of the New England System Operators Club.

▶ D. J. MARCUS, president-treasurer of the Wisconsin Electric Sales Company, Janesville, and associated with the utility industry in the state for many years, died suddenly October 19, of a heart attack. Mr. Marcus started in the electrical business with the Janesville Electric Company, predecessor to the Wisconsin Power & Light Company, and from 1910 to 1917 was manager of the Edgerton Electric Company, which later also became a subsidiary of the Wisconsin Power & Light Company. In 1917 he was made manager of the Janesville Contracting Company, and in 1920, in association with Frank Kennedy, he organized the Wisconsin Electric Sales Company. He was 49 years of age.

LINCOLN

MAXIMUM DEMAND GRAPHICS ELIMINATE THE USE OF CONTACTS



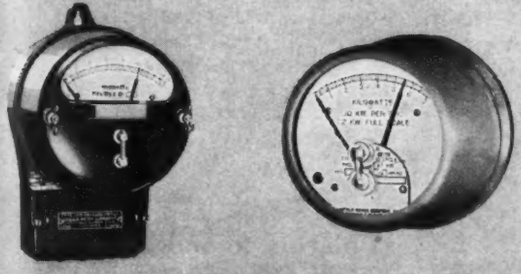


Demand recording devices with delicate electrical contacts present problems which are completely absent when Lincoln Graphic Meters are used. The Lincoln Graphic operates independently of the watthour meter, merely being connected into the same circuit.

The demand measuring element is entirely free of timing mechanisms and rapidly moving parts. A synchronous motor or electrically wound clock has only the duty of driving the recording chart.

The reliability and low maintenance cost of all Lincoln Maximum Demand Meters is best explained by the simplicity of their operation.

INDICATING WATT DEMAND



Type WD (bottom connected) and Type WDS (socket mounting) are supplied for both singlephase and polyphase circuits.

INDICATING AMPERE DEMAND

Type 3 ADH (Horizontal) or 3 ADV (Vertical) for measuring demand of 3-phase substation feeders.

LINCOLN METER COMPANY

SPRINGFIELD, ILLINOIS

Manufacturing AND MARKETS

Predicts Big Gain for Revere Copper

Business of Revere Copper & Brass, Inc., will continue to improve during the next six months, in the opinion of C. D. Dallas, president of the company, who forecasts a considerable gain in last quarter earnings, barring unforeseen circumstances. The company shows an indicated net loss of $539,801 for the third quarter, compared with a deficit of $940,050 in the June period and a profit of $154,403 a year ago.

Report of the company and wholly owned subsidiaries for nine months ended September 30, 1938, subject to audit and year-end adjustments, shows net loss of $2,359,510 after interest, depreciation, amortization and deduction of $1,312,270 loss sustained on metal contents of sales during the period. This compares with a net profit for the nine months ended September 30, 1937, of $2,277,241 after appropriation of $925,852 to metal stock reserve account, equal, after dividend requirements on preferred and $4 convertible class A stock, to $2.11 a share on 521,330 shares of common stock.

Net loss after all charges of $244,534 for the nine months ended September 30 has been reported by Cutler-Hammer, Inc., comparing with a profit of $1,312,638 for the nine months ended September 30. The nine-month loss this year was increased sharply by a poor third quarter, during which a deficit of $168,775 was recorded. In the second quarter the loss was $41,342 and in the first quarter only $34,417. Helping to increase the nine months' loss was a reserve for inventory fluctuations and contingencies of $67,423. The balance sheet as of September 30 shows current assets of $3,741,564; current liabilities, $354,740. The company recently reported orders had shown a slight upturn.

Other manufacturing companies issuing reports are the following:

SQUARE D—Nine months ended September 30: Net profit $208,522, equal to 60 cents each on 343,860 shares of $1 par common stock, against $788,616, or $2.29 each, on 343,754 shares last year. September quarter: Net profit $92,194, or 27 cents each, on 343,860 common shares, against $50,687, or 14 cents each, on 434,860 shares in preceding quarter and $252,466, or 73 cents each, on 343,754 shares in third quarter of 1937.

MCGRAW ELECTRIC—Twelve months to September 30: Net profit $764,582, equal to $1.61 each on 472,600 capital shares. This compares with $1,242,041, or $2.62 a share, for the twelve months to September 30, 1937.

BRIDGEPORT BRASS—Excluding unconsolidated subsidiaries, September quarter: net loss $19,612, compared with $111,150 loss in preceding quarter and net profit of $171,443, equal to 19 cents each on 926,990 capital shares, in third quarter of 1937. Nine months to September 30: Net loss $434,816, contrasted with net profit last year of $931,152, or $1.01 a share.

BABCOCK & WILCOX—Including wholly owned subsidiaries, nine months to September 30: Net loss, exclusive of company's equity in undistributed net profits of companies more than 50 per cent owned but not wholly owned, amounted to $3,025,719 after provision for doubtful accounts. This contrasted with net profit last year of $944,402, equal to $4.21 each on 223,990 share of capital stock.

•

Line Material Declares Dividend; Files with SEC

In a letter recently sent to stockholders Line Material Company stated that a dividend of 20 cents per share had been declared, the first in a number of years. It will be payable January 15, 1939, to holders of record December 27, 1938.

The company has announced the filing of a registration statement with the SEC with respect to 90,000 shares of its common stock. The stock is to be offered publicly from the holdings of William D. Kyle and his family. No financing on the part of the company is involved.

•

Magin Sees Sales Gain

Sales of the Square D Company have increased roughly 10 per cent from the low of four months ago, according to F. W. Magin, president. It was stated that present rate of sales is slightly greater than a month ago. Mr. Magin estimated the gain at possibly 3 to 4 per cent.

Westinghouse Shows $2.31 a Share Net

Business of Westinghouse Electric & Manufacturing Company is showing a slow and unsteady convalescence from its illness, A. W. Robertson, chairman, reports. Mr. Robertson stated that orders received by the company over the last two or three months show no particular trend either up or down, and the levels of new business are about the same to date as in May and June.

It was pointed out by Mr. Robertson that increases or decreases in the company's earnings usually follow several months behind the trend of new business, because of the unavoidable lag between receipt of the order and the delivery of the finished product.

Directors at their meeting last week declared a dividend of 50 cents a share on the common stock and 87½ cents a share on the preferred. For the first nine months this year net profit was $6,212,823, equal after 7 per cent dividends to $2.31 a share on the common. This compares with net profit of $16,726,520, or $6.26 a share, on combined preferred and common stocks. Third quarter profit was $1,712,221, or 63 cents a share, as against $5,394,748, or $2.02 a share, on combined preferred and common in the 1937 period.

Orders received and sales billed in the nine and 12-month periods compare:

Nine months:	1938	1937
Orders received	$113,170,228	$191,200,758
Sales billed	119,530,418	154,839,997
*Net profit	6,212,823	16,726,520
12 months:		
Orders received	$151,509,531	$239,573,704
Sales billed	171,038,728	193,316,391
*Net profit	9,612,711	20,702,105

*After depreciation, federal income taxes, etc.

Unfilled orders on September 30, last, were $43,817,402, as against $78,155,632 a year ago.

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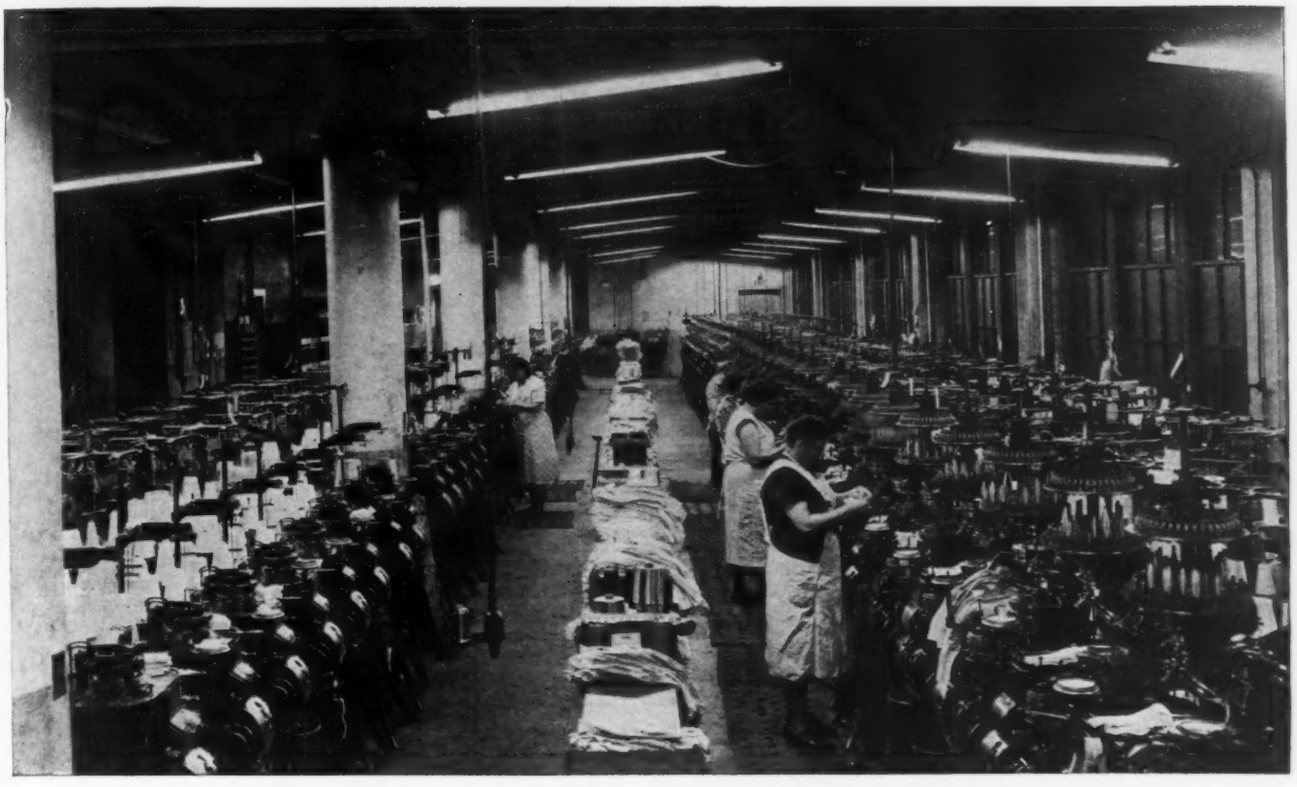
Polaroid to Sell Direct

Polaroid Corporation has announced that its first lighting unit, a desk lamp, sold heretofore by four licensed manufacturers of portable lighting equip-

Light that penetrates and magnifies...



...MAKES "SEEING" PRODUCTIVE

Every thread is clearly defined—so distinct as to appear magnified—when the detail-revealing light of Cooper Hewitts is used. Detecting breaks and tieing broken ends becomes an almost effortless operation. In fact every operation, including inspection, is easier, more accurate, and faster when Cooper Hewitts are in service. » Giving the workers the best light obtainable is true economy. That is why so many mill owners and operators prefer Cooper Hewitts. They make night work as pleasant as day work by giving "better than daylight" illumination throughout every twenty-four hours if needed. The light blends well with daylight; it banishes profit-consuming eye fatigue. » More than 30 years of experience in the application of mercury vapor light to practically every textile operation is at your service. Give us your toughest job—then you be the judge! General Electric Vapor Lamp Company, 578 Adams Street, Hoboken, New Jersey.

Modern Cooper Hewitt lights are more efficient in every respect than ever before. Let us give you the facts about this long, detail-revealing light source which more than a million workers and their employers now enjoy. Write for descriptive literature.

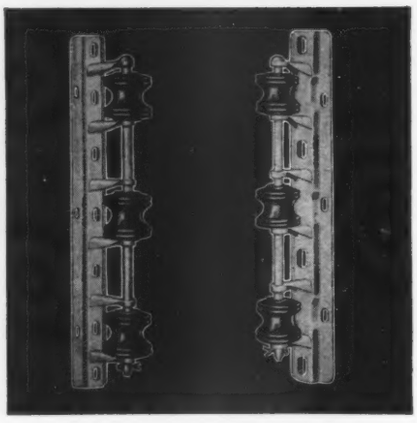
GENERAL ELECTRIC VAPOR LAMP COMPANY

921C

OLIVER

Pole Line Material

PERFECTED PRODUCTS OF OVER FORTY YEARS OF ENGINEERING AND RESEARCH



APACE WITH EVERY NEW POLE LINE MATERIAL REQUIREMENT

Pioneering in the design and manufacture of Pole Line Materials since 1894, Oliver engineers are still pioneering—still constantly improving their products to meet the ever increasing demands of modern electrical power transmission and distribution systems. Get the benefit of these improvements by specifying Oliver for *your* pole line requirements.

OLIVER IRON AND STEEL CORPORATION

PITTSBURGH · PENNSYLVANIA

ESTABLISHED 1863

OLIVER POLE LINE MATERIALS

APPROVED AND ACCEPTED SINCE 1894

ment, will be sold direct by the company to selected jobbing and retail outlets. In announcing the new policy Walter Lown, sales manager, said: "Because the technical aspects of Polaroid present such a revolutionary idea to the lighting industry, we have decided that this direct sales representation by men trained under our own technicians will be in the better interests of the Polaroid Corporation . . ."

•

Manufacturers Make Sales Appointments

The following companies have recently announced appointments to their sales staffs:

Porcelain Products, Inc., has made Robert H. Johnson district sales manager of the Chicago territory. Mr. Johnson was at one time sales manager of the carbon division of the National Carbon Company and was more recently connected with the Ohio Carbon Company as assistant to the president. The new offices of Porcelain Products in Chicago, over which Mr. Johnson will take charge, are located at 100 West Monroe Street.

Kelvinator Corporation has transferred W. C. Mayfield, formerly divisional representative working out of the Cincinnati office, to Detroit as assistant sales manager of air conditioning and automatic heating in place of James A. Lee, who has transferred his interests to the southeastern territory. Other changes include the transfer of E. T. Layport to Chicago as acting divisional manager for the north central division and his replacement in Detroit by C. L. Barlow.

Rockbestos Products Corporation has announced that J. O. Pease has been appointed to represent it in the New England territory, operating out of the New Haven, Conn., office.

•

Form Engineering Company

Central States Industrial Engineers has been organized in DeKalb, Ill., to specialize in designing and building production machinery for the wire industry. Henry A. Nelson, Elmer K. Hansen and Lorence F. Pries, who are responsible for the organization of this company, are all former employees of the American Steel & Wire Company. The company will also engage in designing and building patterns, tools, dies, make industrial surveys, appraisals, draw maps and make blueprints.

New York Metal Prices

	Oct. 26, 1938 Cents per Pound	Nov. 1, 1938 Cents per Pound
Copper electrolytic	11.25*	11.25*
Lead Am. S. & R. price	5.10	5.10
Antimony	12.25	12.25
Nickel ingot	35.00	35.00
Zinc spot	5.44	5.44
Tin straits	46.35	46.10
Aluminum, 99 per cent	20.00	20.00

* Delivered Connecticut Valley.

To Combat Another Emergency Like This

They Specified

DILECTO

INSULATION

Above—Submerged under 7,000 tons of ice, the reconditioning of these generators presented a major engineering problem.

Right—The collar and ground insulation of field coils were beyond salvage and rebuilt with Dilecto — to obviate similar damage in the future.

Last winter a great ice jam in the Niagara River crippled the Ontario Power Plant of the Hydro-Electric Power Commission of Ontario. One by one these generators were rehabilitated and returned to service.

When it was found necessary to repair the damaged equipment, the engineers looked for an insulating material possessing a unique combination of properties. They desired insulation of high dielectric and mechanical strength, which would withstand immersion in water as well as resist deterioration under constant high temperature.

It is significant, therefore, that DILECTO was selected to replace the damaged insulation on the field coils of the generators.

It was our privilege to collaborate with the Hydro-Electric Power Commission engineers in the solution of this unusual problem. It will be our pleasure to consult with you regarding your problems—whether they be those of production, repairs or special jobs. Write "Insulation Headquarters."

CONTINENTAL-DIAMOND FIBRE CO.

NEWARK, DELAWARE

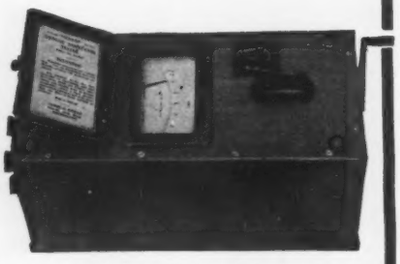
This is the

INSTRUMENT

that takes the

UNCERTAINTY

out of **GROUNDING**



"MEGGER" GROUND TESTER
One Operation—No Balancing
"Reads like a Voltmeter"

BECAUSE it provides a simple, accurate and reliable means for measuring ground resistance, the "Megger" Ground Tester has become a necessity. It gives at low cost information essential to the solution of grounding problems.

And because the "Megger" Ground Tester is such a practical device, Power Companies, Industrial Plants, Railroads and Telephone and Telegraph Companies have by its use raised their standards of safety, improved the performance of their electrical equipment, and have simplified their maintenance procedure.

Catalog 1425-W describes the "Megger" Ground Tester and also the light weight and small size "Meg" Ground Tester. Interesting data on ground testing is also included. Write for a copy.

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

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Other Biddle Specialties:

"Megger" Insulation Testing Instruments
"Megger" Capacitance Meter
"Ducter" Low Resistance Testing Sets
"Dionic" Water Tester
"Frahm" Vibrating-Reed Tachometers and Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

Field Reports on Business

The government-utility war power program is expected to stimulate manufacturing activity in all lines. The utilities are to add 1,000,000 kw. to generating capacity. Many manufacturers report an increase in business which is expected to expand in the near future. Electrical appliance sales are going in good volume.

NEW YORK

The continued rise in industrial activity has overshadowed the poor third-quarter earnings reports now being made public. Many companies are reporting an increase in orders and shipments. The trend is expected to gain momentum as the season progresses.

Announcement of the government-utility war power program and the proposed addition of 1,000,000 kw. to generating capacity has emphasized the importance of utility construction in the national economy. Utility budgets are expected to be expanded for 1939, with funds not spent this year being carried over as additions to the regular budget. The peace move has strengthened confidence to the extent that new financing may be enlarged.

Electrical manufacturers are aiding utilities and department stores in pushing holiday electrical appliances. General Electric is using the theme copy of "For a practical person with a sentimental side" in its sales aids. Large space in color in ten magazines will support the drive.

Local sales of electrical appliances are tending upward, with continued emphasis being placed by Consolidated Edison on its large-scale program of package sales. The utility has informed dealers that the larger size refrigerators are best suited for this area.

NEW ENGLAND

Electrical equipment buying in this district indicates a good deal of caution and also that the upward trend so fondly hoped for and to some extent predicted recently is still in the offing. Heavy electrical machinery interest is still confined largely to studies for power expansion among a few of the leading industrial plants. A few small tubro-generator units up to 500 kw. have been placed in this district since summer, but the bulk of orders received lately have been for replacements and repair supplies occasioned by the recent hurricane.

Small motors are moving in small lots. More than 1,500 hp. is estimated to have been purchased by textile mills since the storm of September 21. Machine manufacturers are buying a few motors; one representative notes that his inquiries are increasing and reports selling 60 hp. in small motors during the past week.

Transmission lines materials are attracting attention. About 45 miles of new line located in southeastern Massachusetts and the Cape Cod district involves considerable volume of supplies that are now being bid on. About 1,500 insulators will be required, together with poles, wire and line hardware. Since September 21, Hartford Electric Light Company has bought 650,000 feet of wire, 2,000 watt-hour meters and more than two carloads of crossarms.

Last week orders for wiring materials and small switches amounting to about $7,200 were placed by the city of Boston for use in the maintenance of its institutions. A group of apartments now under construction in Boston and suburbs will require about 200 electric refrigerators soon. Appliance sales in the Boston area are gaining; in the Vermont and western Massachusetts districts a slight upward surge in buying is reported.

CHICAGO

General business activity in this area showed a tendency toward irregularity last week. Retail trade, on the whole, remains a distinct disappointment and again failed to narrow the margin of decline between this year and last. In the face of this showing, however, electrical appliance sales are not so discouraging and the smaller items are moving in much greater volume.

Industrial production continues to make slow but steady progress toward recovery. Orders for electrical equipment have increased in number, but in general are of comparatively small amounts. Small motors, switches and transformers are moving in good volume. Pole line equipment and wire sales are steady as a result of the continued activity of the REA throughout the Middle West. Utility buying remains slow, although there is some construction work in progress in the smaller cities.

Expansion of facilities is taking place in the stock yards, resulting in considerable electrical apparatus business. Additional business is expected from the steel mills as activity climbs steadily upward. The outlook for building construction is more optimistic as an increasing number of projects are becoming active.

Of 42 manufacturers reporting net sales for September to the Electric Association, 20 showed an increase over August, while 30 had a decline from a year ago.

PACIFIC COAST

Much building construction over the entire Pacific Coast is reported, but it is practically all public, especially for the Army and Navy. An estimated $26,000,000 of new PWA work has been begun in the California-Arizona-Utah-Nevada sector during October, the electrical portion being about 2 per cent only of the total. San Francisco is initiating a $7,000,000 school and hospital program, of which the electrical work will exceed $600,000 because of elaborate modern installations.

Much heavy machinery business is in sight, including Grand Coulee turbine bids averaging $1,500,000 for three 150,000 hp. and $70,000 for three governors; Elephant Butte, New Mexico, turbines for $130,000, governors for $40,000 and generators for $265,000; Green Mountain, Colo., turbines for $100,000, governors for $25,000, generators for $220,000. Low bid for the Green Mountain dam and power house was $4,226,206.

Central California business has improved noticeably since settlement of recent strike of distributors' warehousemen. Wiring staples are moving well in smaller wire and conduit sizes, though hampered by considerable spring overstocks at sub-normal prices. Crops have been excellent, with surpluses less than had been feared, but many natural factors contributing to electrical business in a territory still largely agricultural will not record themselves appreciably until 1939.

ON GUARD

against service interruptions!

3 SIZES

TYPE 660 . . . FOR VOLTAGES UP TO 8,000
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TYPE 680 . . . FOR VOLTAGES UP TO 15,000

Handle most PRIMARY line requirements

● More and more, HEMINGRAY Series-600 Insulators are going up because they squarely meet the day-to-day requirements of ordinary service and defy the rigors of unusual weather hazards. These tougher insulators, scientifically designed and painstakingly manufactured, assure long, trouble-free performance and high efficiency at moderate cost.

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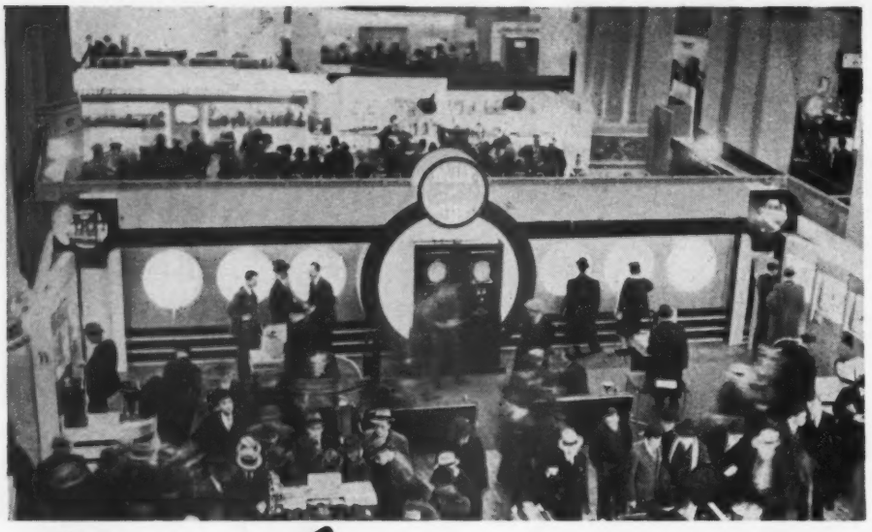
"First in Glass"

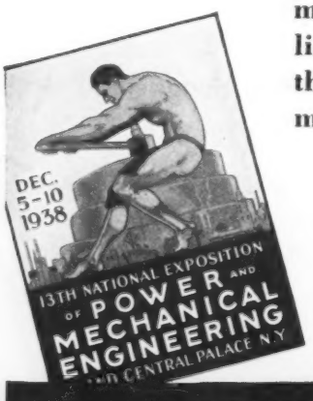


New Opportunities

FOR ELECTRICAL MEN

The world is ready for more abundant power, more effective ways to generate, control, distribute and apply it. Ample rewards await those who know the newest and best equipment, materials, instruments and supplies that can make the production and use of electrical energy ever more profitable.

Keep up to date by visiting the National Power Show this year. On three great exposition floors of Grand Central Palace, New York, you can see, examine, compare and discuss the applications of the best products of hundreds of manufacturers who have poured millions of dollars into development so that power may be produced and used more efficiently.



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13th NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING..

GRAND CENTRAL PALACE · NEW YORK · DEC. 5-10, 1938

Management International Exposition Company

8556

A Different Congress

[*Continued from page* 62]

Much the same situation, though it is less spectacular, runs through the House elections. Yet the important thing is neither the Republican gains nor the replacement of hundred per centers with "Yes, but" Democrats. It is the knowledge now held by every man who will be in the new Congress that it will not mean his political death if he refuses to jump through a hoop every time Corcoran or Cohen or Charley West comes running to demand that he vote for some George Norris or John Rankin proposal aimed at the electrical industry.

Even more important, in a way, they will know that it will not necessarily mean continued office holding if they consistently vote for every proposal sponsored at the White House. They know about Dieterich, in Illinois, who staked his future on just that. They know about Maury Maverick and his 200 per cent colleagues from Texas. They know about Normal Hamilton in Virginia.

So the test on each rollcall for the next two years is going to be different. Each senator and representative is going to figure out how his own district or state stands on the issue in question and be a lot more concerned about that than whether the White House wants it or not.

•

Electric Costs Computed

At the suggestion of Public Utilities Commissioner Joseph W. Alsop the Connecticut State College Extension Service is preparing for distribution to rural dwellers who may be hoping to install electricity a schedule by which they can calculate the amount of energy they will need for various farm operations.

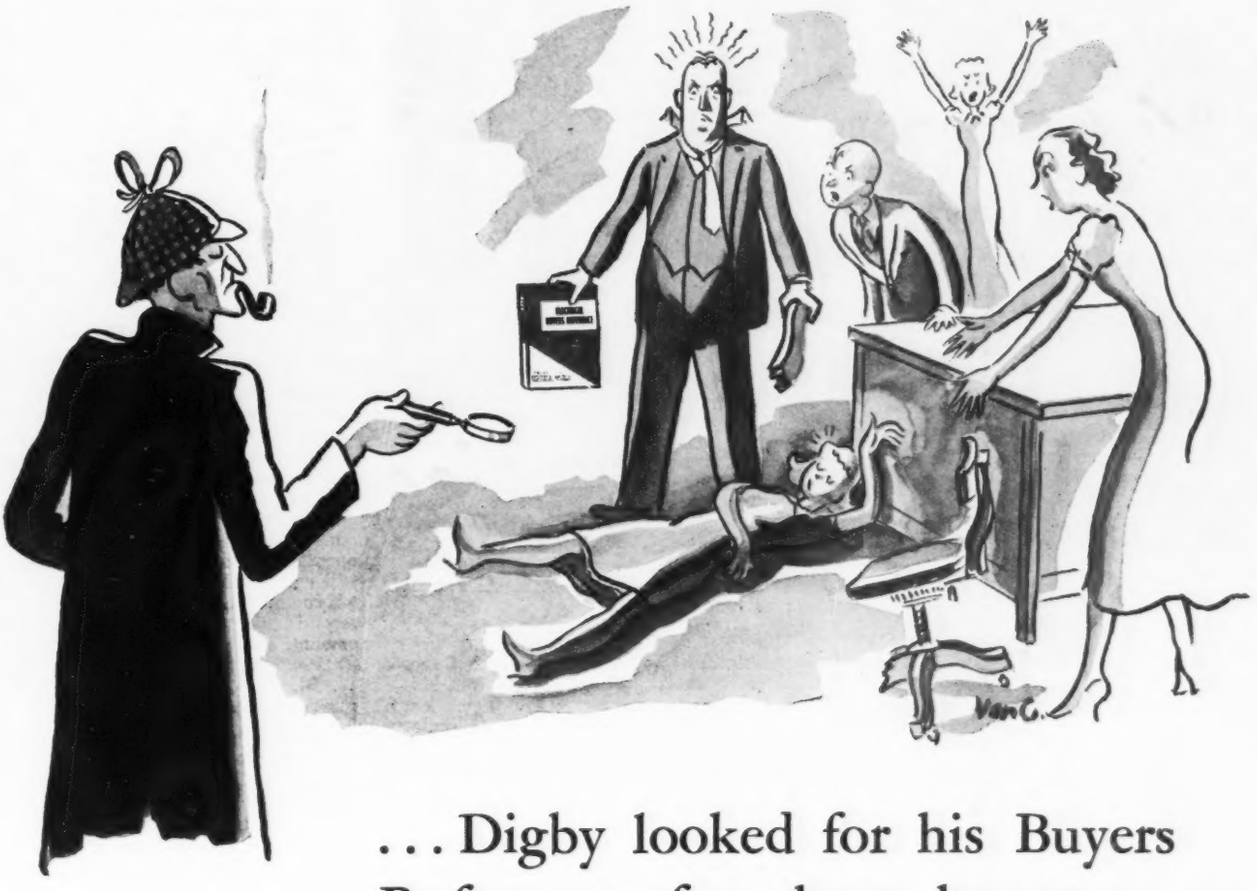
When completed the schedule will also include estimates of the amount of money needed to buy electric equipment of all sorts so that a rural dweller may figure not only his probable consumption of energy but the amount of capital he must invest to electrify his farm.

•

To Light New Jersey Highway

The Public Service Electric & Gas Company will install General Electric incandescent luminaires along four and a half miles of the Black Horse Pike in Camden county, N. J.

"Justifiable homicide, Watson...



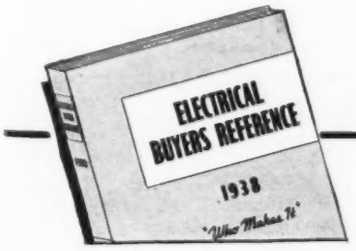
...Digby looked for his Buyers Reference for three hours... *...she was sitting on it"*

Too bad. Sally was a good stenog. But she was short — and that big blue and orange Electrical Buyers Reference brought her up to desk level.

Of course she didn't know that the Buyers Reference was old Digby's right arm when it came to buying. He uses it constantly to look up manufacturers of electrical and allied products.

Don't sit on *your* copy of the Electrical Buyers Reference. Use it to get buying information — it will save you time and money!

The Looking-Up-Place for Everything Electrical



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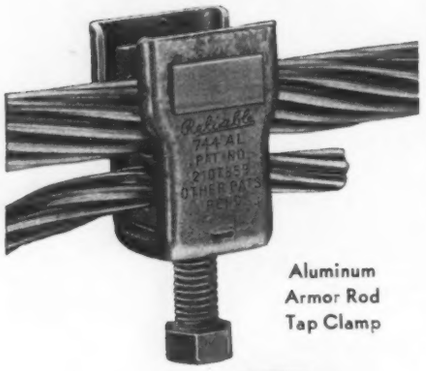

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Aluminum to Copper Connector

Type A Copperweld Straightline Splice

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OVER 25 YEARS SERVICE TO THE UTILITIES

1343 - 52 ROSCOE AVENUE - CHICAGO, ILLINOIS

Sales Opportunities

LITTLE ROCK, ARK.—Arkansas Power & Light Company, Little Rock, has authorized extensions in primary and secondary lines in parts of Saline and Pulaski Counties, including lines and service facilities in vicinity of Sweet Home, last noted county. Permission has been secured.

ALBUQUERQUE. N. M.—Middle Rio Grande Conservancy District, Albuquerque, plans hydro-electric power development on Upper Rio Grande River, including power dam, generating station, power substations and switching stations, transmission and distributing lines. Cost estimated close to $3,500,000, of which about $1,500,000 will represent a federal grant. Financing is under way. W. C. Ostreich is engineer for district.

CROSSETT, ARK.—Crossett Paper Mills plan installation of motors and controls, conveyors, loaders, electric hoists and other equipment for expansion and improvements in kraft paper mills. Also will make extensions in power house used for mill service. with installation of new boiler unit and accessories, turbo-generator and complete auxiliary equipment for increased output. Entire project will cost about $750,000 and will be carried out over a period of months. Company is a subsidiary of Crossett Lumber Company, same place. K. A. Forrest is general manager.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, 58th Street and First Avenue, Brooklyn, receives bids until November 14 for 36,496 lineal feet of telephone cable and 28 reels (Circular 72); also at same time for tape recorders, tape pullers, rewinder reel attachments, keying heads and other equipment (Circular 73).

SEAFORD, DEL.—E. I. du Pont de Nemours & Company, Rayon Division, du Pont Building, Wilmington, Del., has acquired tract of about 340 acres of land near town limits of Seaford, fronting on Nanticoke River, for proposed rayon yarn mill, referred to recently in these columns, and will proceed with erection of initial units, including power house, at early date. New mill will be electrically-operated, with installation of motors and controls, power substation facilities, regulators, conveyors, etc. Completion is scheduled late in 1939 or early 1940. Cost estimated over $5,000,000. Company engineering department, address noted, is in charge.

LULING, TEX.—Has plans in progress for municipal electrical distributing system, including transmission line for power supply and distribution power substation. Cost about $170,000. Financing in part is being arranged through federal aid. Homer Trimble, 605 Bellevue Place, Austin, Tex., is consulting engineer.

ODESSA, MO.—Has plans for new municipal electric power plant and electrical distribution system, for which financing in amount of $139,000 has been arranged through federal aid. Bids are scheduled to be asked soon. E. T. Archer & Company, New England Building, Kansas City, Mo., are consulting engineers.

CHARLESTON, S. C.—South Carolina Public Service Authority, care of Harza Engineering Company, 27 Cumberland Street, Charleston, consulting engineer, will receive bids at last noted office until November 22 for hydraulic turbine units, governors and accessories, with total rating of 213,000 hp., for installation at Pinopolis hydro-electric generating plant, Santee-Cooper project. Also at same time for electric generator units and auxiliary equipment with gross capacity of about 131,000 kva. Engineer noted is in charge.

CLINTON, MICH.—Plans extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost estimated close to $80,000. Financing is being arranged.

LAS VEGAS, NEV.—Yellowpine Power District No. 6, Goodsprings, Nev., care of H. W. Crozier, 209 South Third Street, Las Vegas, consulting engineer, plans early construction of about 85 miles of 12.5-kv. power lines, substation units with total rating of 3000-kva., line distribution transformers with capacity of 4000-kva., service facilities, meters, etc. Cost about $250,000. Financing is being arranged through federal aid.

PEARISBURG, VA.—Celanese Corporation of America, Inc., 180 Madison Avenue, New York, N. Y., has plans nearing completion and will begin work soon on new rayon yarn mill on tract of about 1200 acres of land near Pearisburg, acquired a number of months ago. Plant will comprise several large units, with installation of motors and controls, regulators, conveyors and other equipment; a power plant will be built for mill service, as well as an electric-operated pumping station. Initial plant will cost about $5,000,000 and immediately on completion work will proceed with a second unit to cost approximately a like amount, making total investment of $10,000,000. Financing has been arranged. W. M. C. Cameron is vice-president in charge of operations.

CHATTANOOGA, TENN.—Chattanooga Electric Power Board, S. R. Finley, general manager, will take bids soon for two new electric power substations, to be known as substations Nos. 2 and 4, situated in North Chattanooga and in Elmo district, respectively. Each unit is estimated to cost about $150,000, with transformers, switchgear and auxiliary equipment. Plans are being considered for new transmission line from Chickamauga hydro-electric power plant of TVA for additional power supply for municipality, making the third transmission line connection with TVA system.

BAYTOWN, TEX.—Humble Oil & Refining Company, Houston, Tex., plans installation of motors, controls, conveyors, electric pumping machinery and other equipment in new phenol plant addition at main oil refinery at Baytown. Work is scheduled to begin at once. Cost close to $1,000,000.

TAYLOR, TEX.—Has plans maturing for municipal electrical distribution system, including transmission line for power supply connection and power substation. Cost about $335,000. Financing is being arranged through federal aid. Beretta Engineers, Inc., National Bank of Commerce Building, San Antonio, Tex., is consulting engineer.

MELROSE, MINN.—Plans expansion and improvements in municipal electric power plant, including installation of new equipment to replace present worn-out apparatus. Financing is being arranged through federal aid. Ellerbe & Company, First National Bank Building, St. Paul, Minn., are consulting engineers.

ELDORADO SPRINGS, MO.—Has plans maturing for new municipal electric power plant, including electrical distribution lines. Cost about $120,000, of which $66,000 will be a bond issue, recently voted. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are consulting engineers.

Municipal Plants

PORT CLINTON, OHIO—Flat price of $135,000 has been offered the Ohio Public Service Company for its distribution system, including poles, lines, meters and other equipment, but not the building or office equipment of the company. The offer was made following notice from the PWA that it was necessary to make an offer to buy the existing system before the agency could take any action on a $300,000 grant applied for by the city.

GUTHRIE, OKLA.—Proposal for the installation of a municipal plant, through a bond issue of $373,000 to match PWA funds, was defeated by a vote of more than two to one. A total of 893 votes were cast against the proposal while 442 ballots were cast for it. Oklahoma Gas & Electric Company serves the city.

DUNCAN, OKLA.—Voters have turned down the proposal to vote $60,000 in bonds to enlarge the municipal plant. A PWA grant of an almost equal amount had been approved for the project. Voters cast 202 ballots against the bond issue and 107 for it. The municipal plant competes with the Southwestern Light & Power Company.

GLENWOOD SPRINGS, COLO.—Voters in an October election voted against the city undertaking the financing of a municipal plant or purchasing the property of the utility now serving the city. Both propositions were defeated, 209 to 136 and 197 to 130.

ARCADIA, FLA.—Freeholders voted, 292 to 159, in favor of the city borrowing $110,000 to construct a municipal power plant. PWA will be asked for a $100,000 grant.

ROLFE, IOWA—Voters at the recent municipal election defeated the $54,450 bond issue to finance the city's share of the cost of constructing and completing a municipal light and power plant and distribution system.

CASCADE, IOWA—At a recent special election the proposal to build a municipal light and power plant carried by a vote of 496 to 74. Engineers estimate the total cost at $110,000, of which 45 per cent is expected to be a PWA grant. Application has been made, and the remaining cost is to be paid for out of the future earnings of the plant.

THIBODAUX, LA.—Town contemplates construction of a power plant and electric distribution system, at a cost of approximately $80,000.

MT. PLEASANT, MICH.—Voters showed their satisfaction with Consumers Power Company electric service recently by emphatically turning down a proposal to build a municipal plant. A PWA grant of $218,000 had been assured, representing 45 per cent of the total estimated cost of $485,000. The proposal required a 60 per cent vote for passage, but actually received far less than a majority.

CARROLLTON, MO.—Circuit Judge J. S. Rooney has granted a temporary injunction against the city on the petition of the Kansas City Power & Light Company to stop the city from erecting a municipal light plant. Citizens voted $200,000 in bonds in September to erect a plant. Lawyers for the company contended the city had not exercised its optional rights to purchase the private plant despite the company's willingness to sell.

WEST PLAINS, MO.—PWA has allotted a grant of $74,700 to help finance a municipal

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POLE LINE MATERIALS

Made from the best quality steel . . . manufactured with consummate skill . . . hot galvanized for weather protection . . . outstanding for their durability in the field of service. Next time specify U-S materials for overhead or underground construction.

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(In rounds, flats and squares)

BARE and TINNED STRAND

URC WEATHERPROOF WIRE

COTTON, PAPER and ASBESTOS MAGNET WIRE
(In rounds, flats and squares)

RUBBER INSULATED WIRES and CORDS

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light and power plant and distribution system estimated to cost $166,000.

ELDORADO SPRINGS, MO.—Voters have approved a $65,000 bond issue to supplement a PWA grant of $54,000 in the financing of a municipal light and power plant building, equipment and distribution system. Cost has been estimated at $119,000.

OSCEOLA, MO.—Voters have disapproved a proposed bond issue of $41,800 to help finance a municipal light and power plant and distribution system estimated at $76,000. PWA funds were sought for the balance.

BRAYMER, MO.—A $47,000 bond issue for a municipal light and power plant and distribution system was defeated at a recent election. A PWA grant of $38,452 had been allotted to the city for the $85,000 project.

LATHROP, MO.—Voters have approved a $41,250 bond issue for a municipal light and power plant and distribution system. Cost is approximately $75,000. PWA funds will take care of the balance.

SULLIVAN, MO.—PWA has allotted this city a grant of $56,250 to help finance the construction of a municipal electric system estimated to cost $125,000.

OWENSVILLE, MO.—City has received a PWA grant of $47,925 for the proposed municipal light and power plant, equipment and distribution lines. Cost has been estimated at $106,500.

PLEASANT HILL, MO.—City has approved an $85,250 bond issue for a municipal light and power plant, equipment and distribution system by a vote of 682 to 316. A two-thirds majority was necessary for passage. PWA recently allotted $72,500 for the project.

TUCUMCARI, N. M.—City Council has adopted a resolution of acceptance of the recent PWA grant for construction of a municipal power plant and declined to take action on a proposal by the Tucumcari Light & Power Company for what was described as a drastic rate reduction. Prior to taking official action on the acceptance of the grant, Council heard representatives of the utility company relative to a rate cut.

AUBURN, NEB.—A condemnation court has set $342,000 as the price for the Western Public Service Company property sought by the city in its lengthy efforts to acquire its own municipal electrical system. The city had offered the company $230,039 and the company had asked $396,077.

ABBEVILLE, S. C.—PWA has advanced $435,000 in loan and grant for construction of a municipally owned power system. The outright grant of $196,000 and the loan of $239,000 will complete the construction of a hydro-electric development started by a private plant, it was stated. The plans, as approved by the PWA, propose a power house large enough for three units, of which two are to be presently installed, one to generate 1,500 kw. and another to generate 500 kw. In announcing approval of the project, PWA stated that at present Abbeville purchases power from a private utility, and "it is estimated that it can generate and distribute power from the proposed project at a cost approximately two-thirds of that of purchased power."

HALLS, TENN.—Citizens cast a 234 to 19 vote recently in favor of a $26,000 bond issue with which to purchase the power and light company system or build a municipal plant to use TVA power. The town has already received a $21,000 grant from the PWA to build its system. West Tennessee

Connect With
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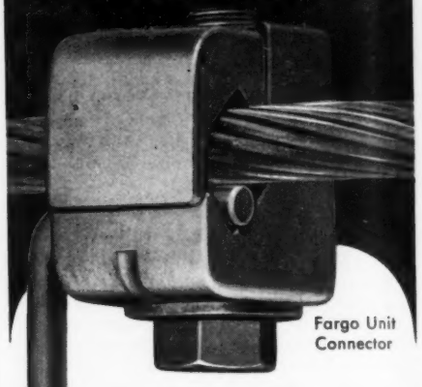
When You TAP or SPLICE the line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● RE-USE the same FARGO UNIT CONNECTOR year after year . . . it still "grips like a vise". One-piece construction . . . nothing to lose . . . saves time and trouble.

● SPLICE your line with the FARGO LINE SPLICE and it *stays* spliced. Even burred end wires can't slip inside the Fargo 4-jaw gripping unit with "Safety Zone" feature. Write to South Milwaukee, Wis., for connector information.

Fargo Line Splice

Made by Fargo Manufacturing Co.

DISTRIBUTED BY
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Power & Light Company has been offered $25,000 for its properties.

El Campo, Tex.—Construction and municipal ownership of the electric light and power plant, water works plant and natural gas distribution system was voted at a recent election. Revenue bonds totaling $330,000 were authorized. Of this amount $145,000 is to be for the light plant. Electric light and power for the city is now being served by the Central Power & Light Company.

Goose Creek, Tex.—Taxpayers have voted down in the recent election the proposal of City Council for the issuing of $320,000 of revenue bonds for the construction of an electric light and power plant.

Covington, Va.—A proposed bond issue of $268,000 for the erection of a municipal electric plant has been voted down, four to one. Total vote against the plant was 544, for the plant 147. A grant of $19,600 had been secured from the PWA. This sum was to have been matched with $268,000 from Covington. In voting down the proposal citizens settled an issue which has been brewing since 1932.

•

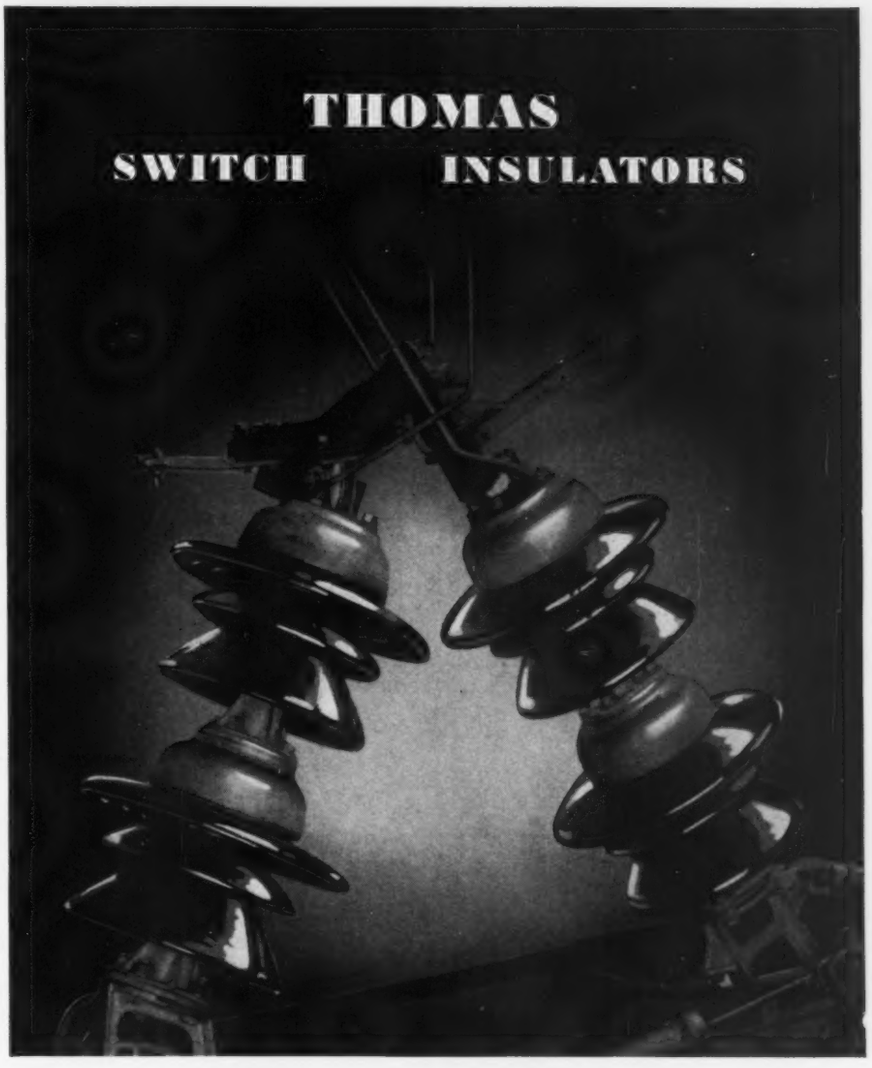
Recent Rate Changes

South Carolina Electric & Gas Company has reduced its electric rates over its entire system, according to an announcement by the state Public Service Commission. The reductions, expected to effect a saving of $510,000 yearly, will apply to almost all types of customer. The commission said the rates would mean substantial savings for residential, industrial and commercial customers as well as municipalities in central South Carolina.

Tennessee Light & Power Company's reduction in electric rates has been approved by the Tennessee Utilities Commission. The cut amounts to 10 per cent and will mean a $6,100 annual saving to residential and commercial consumers. The company operates at Camden and Big Sandy in Benton County, west Tennessee, and in Robertson, Cheatham and Sumner counties in middle Tennessee.

Wisconsin Public Service Commission has announced that summer cottage residents who are seasonal customers of the Wisconsin Public Service Corporation in central and northern Wisconsin, excepting those in the Oshkosh area, will save approximately $4,500 annually as a result of an electric rate reduction. Under the reduced rates seasonal customers will pay a fixed charge of $1 a month from May to October and an energy charge ranging from 9.5 to 2.5 cents per kilowatt-hour. The former minimum for the season for these customers was $12. Under the new rate these consumers will pay $2.25 for the first 10 kw.-hr. consumed during a month and 7½ cents for each of the succeeding 40 kw.-hr. and 3 cents for each kilowatt-hour in excess of 50 kw.-hr.

Tucumcari Light & Power Company has announced a reduction in electric rates despite the fact that the city has decided to accept a government grant for a municipal plant. "Our revenue earnings at this time," the company announced, "will not warrant such a reduction, but our interest in effecting a saving to our consumers and to the taxpayers and our faith in Tucumcari's future has caused us to make this reduction." Reductions, effective with the November 1 billing, are for residential, commercial and general power service.



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- From a most complete line we offer the Engineer a wide choice of designs and sizes. All are improved and modern, representing the best as proved in Factory, Laboratory, and Service Tests.
- Noted for operating faithfully under all conditions, Thomas Switch Insulators from their ability to outlast others will prove more economical in lowering maintenance costs.

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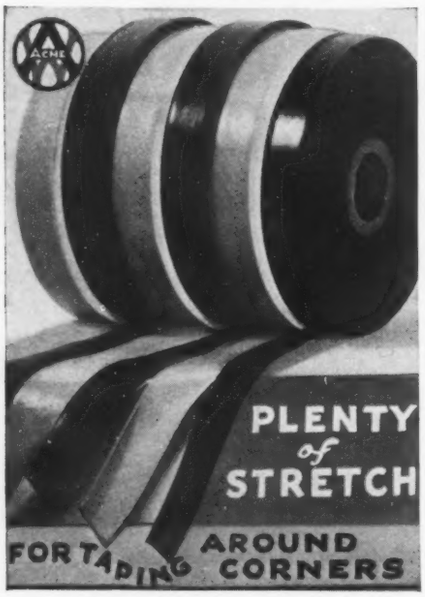

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are made of high grade cotton fabric treated with special varnishes from Acme's own varnish plant. They have great tensile strength and flexibility and may be stretched snugly into all corners and crevices, making a mechanically smooth and electrically efficient seal. Offered in bias or straight tapes or rolls up to 36" wide, yellow or black. Samples if requested. Address *The Acme Wire Co., New Haven, Conn.*

Acme Wire Products

VARNISHED INSULATIONS — MAGNET WIRE
COILS — CAPACITORS

New REA Allotments for Twelve States

REA has recently announced allotments totaling $4,008,500 for 27 projects in 12 states. This brings allotments made since REA was established in 1935 to $147,485,645. Among the recent allotments were the following:

ARKANSAS—Ozark Rural Electric Co-operative Corporation, Shannon Pharr, president, Fayetteville, $244,000 to build 260 miles of line, 888 customers in Washington, Madison and Benton counties.

GEORGIA—Troup Rural Electric Corporation, F. M. Freeman, superintendent, LaGrange, $135,000 to build 152 miles of line, 558 customers in Troup, Harris, Meriwether counties, Ga., and Chambers County, Ala. Upson County Electric Membership Corporation, Thomas S. Jackson, superintendent, Thomaston, $129,000 to build 121 miles of line, 631 customers in Pike, Talbot and Upson counties.

MINNESOTA—Anoka County Co-operative Light and Power Association, George L. Morris, superintendent, Anoka, $209,000 to build 173 miles of line, 666 customers in Anoka, Sherburne, Washington, Isanti and Ramsey counties. Steele-Waseca Co-operative Electric Association, L. P. Zimmerman, superintendent, Waseca, $250,000 to build 189 miles of line, 554 customers in Steele, Waseca, Dodge, Rice, Freeborn and Blue Earth counties.

NEBRASKA—Loup River Public Power District, V. M. Young, superintendent, Columbus, $214,000 to build 220 miles of line, 544 customers in Platte and Colfax counties.

NORTH CAROLINA—Caldwell Mutual Corporation, George F. Messick, superintendent, Lenoir, $377,000 to build 276 miles of line, 1,507 customers in Alleghany, Ashe, Watauga Counties, N. C., and 2 miles in Tennessee.

NORTH DAKOTA—Cass County Electric Co-operative, Inc., Max Strehlow, superintendent, Kindred, $250,000 to build 239 miles of line, 550 customers in Cass, Barnes, Ransom, Sargent and La Moure counties.

OHIO—Belmont Electric Co-operative, Inc., H. L. McAllister, superintendent, St. Clairsville, $220,000 to build 186 miles of line, 993 customers in Monroe, Belmont and Harrison counties. Licking Rural Electric Co-operative, Inc., C. D. Dunlap, superintendent, Newark, $258,000 to build 244 miles of line, 655 customers in Knox, Licking and Perry counties. Guernsey-Muskingum Electric Co-operative, Inc., H. B. Smith, superintendent, New Concord, $237,000 to build 242 miles of line, 860 customers in Guernsey, Muskingum and Noble counties.

TEXAS—Fannin County Electric Co-operative, Inc., J. B. Richey, superintendent, Bonham, $111,000 to build 115 miles of line, 418 customers in Fannin and Collin counties. Lyntegar Electric Co-operative, Inc., John Heck, president, Tahoka, $304,000 to build 329 miles of line, 988 customers in Lynn, Hockley, Terry and Garza counties. Deep East Texas Electric Co-operative, D. N. Beasley, superintendent, San Augustine, $223,000 to build 247 miles of line, 768 customers in Shelby, Nacogdoches, San Augustine and Sabine counties.

WISCONSIN—Oconto Electric Co-operative, Earl G. Redman, superintendent, Gillett, $106,000 to build 91 miles of line, 316 customers in Oconto, Marinette and Shawano counties. Vernon County Electric Co-operative, N. F. Leifer, manager, Westby, $157,000 to build 135 miles of line.

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Construction contracts:

Butler County Electric Membership Corporation, Greenville, Ala., Edwin H. Wallace, superintendent, contract to Smith Engineering and Construction Company, Pensacola, Fla., for building entire project, 271 miles of line, 750 customers; bid $137,469.

O and A Electric Co-operative, Zeeland, Mich., Bruce Watkins, superintendent, contract to Donovan Construction Company, St. Paul, Minn., for building second section of project, 859 miles of line, 2,000 customers; bid $775,889.

P.I.C.K. Co-operative Electric Association, Braham, Minn., Beauford Johnson, superintendent, contract to Acme Construction Company, St. Paul and Martin Wunderlich for building second section of project, 259 miles of line, 799 customers; bid $190,661.

Meeker Co-operative Light and Power Association, Litchfield, Minn., Irving J. Clinton, superintendent, contract to Sterling Electric Company, Minneapolis, for building another section of project, 155 miles of line, 418 customers; bid $133,313.

Stearns Co-operative Electric Association, Melrose, Minn., Chrys P. Stalberger, superintendent, contract to E. W. Wylie, Inc., St. Paul, for building second section of project, 509 miles of line; bid $395,040.

Brown County Rural Electrical Association, Sleepy Eye, Minn., Hillman Rosseth, superintendent, contract to Zontelli Brothers and E. A. Reither, Crosby and Aitkin, Minn., for building second section of project, 290 miles of line, 610 customers; bid $205,312.

Wright-Hennepin Co-operative Electric Association, Cokato, Minn., Edward R. Slebiska, superintendent, contract to Aveldson Construction Company, Litchfield, Minn., for building second section of project, 197 miles of line, 551 customers; bid $155,285.

Minnesota Valley Electric Co-operative, Jordan, Minn., William Saltmarsh, manager, contract to Acme Construction Company and Martin Wunderlich, St. Paul, for building another section of project, 236 miles of line, 487 customers; bid $188,530.

Trempealeau Electric Co-operative, Arcadia, Wis., M. J. Lawrence, superintendent, contract to Snyder & Johnston, Inc., Humboldt, Iowa, for building second section of project, 183 miles of line, 380 customers; bid $129,886.

•

Wisconsin Hydro Progresses

Work on the additions to Grandfather Falls hydro station of the Wisconsin Public Service Corporation on the Wisconsin River near Merrill, Wis., is progressing on schedule, according to A. G. Carson, vice-president and chief engineer. The new additions, on which construction was started April 1 last, will add 17,000 kw. to the system.

•

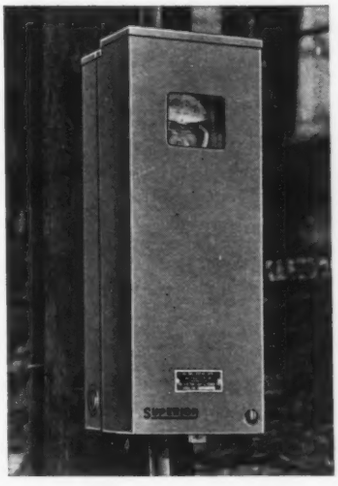
Water Heater Booklet

The Modern Kitchen Bureau has prepared a booklet "The Electric Water Heater Speaks for Itself" as an aid to salesmen. The brief manual points out the advantages of electric water heaters and can be obtained from the Bureau office in New York for five cents each.

"KIDNAPPED KURRENT"

(polyphase style)

Each case of polyphase current diversion is expensive. If polyphase diversion was as prevalent as single phase — oh my!



Those big revenue polyphase meters of yours, ALL OF THEM, deserve proper protection from dirt, deviltry and diversion.

Superior polyphase Overall Meter Enclosures will protect those meters.

Write for Bulletin No. 379

Superior Switchboard & Devices Company

CANTON, OHIO

*Been at it Since 1920

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REG. U. S. PAT. OFF.

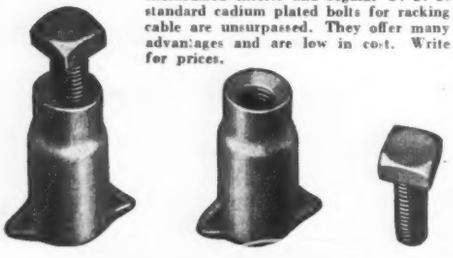
Cut the Concrete Manhole Construction Costs with PENOTE SECTIONAL STEEL MANHOLE FORMS

Penote Forms for OCTAGON MANHOLE

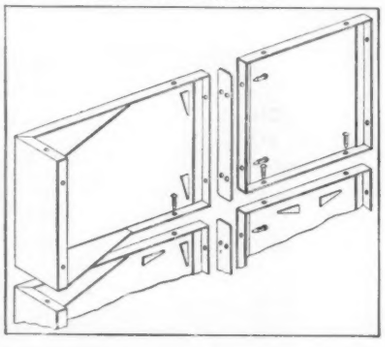
Your manholes, built with Penote Steel, Sectional Forms, assure greatest flexibility, cost least and take less time to build. Manufactured from husky steel reinforced with "L" angles, Penote Forms are practically indestructible. With one set of forms you can build innumerable manholes—no skilled labor is required—any laborer with an ordinary hammer can quickly and easily install and remove them—they permit pouring complete manhole in one operation and can be used advantageously in loose and fluid soil. All forms are interchangeable. So many sizes are available that we cannot list them here but send a list of your manhole size requirements and we will tell you what investment is required. Write today.

PENOTE CONCRETE INSERTS and BOLTS for CABLE RACKS . . .

are illustrated below. These semi-steel, sherardized inserts and regular U. S. S. standard cadium plated bolts for racking cable are unsurpassed. They offer many advantages and are low in cost. Write for prices.



ASSEMBLY DETAIL



THE CLEVELAND TRENCHER COMPANY

20100 St. Clair Ave. **Cleveland, Ohio**

Controlling Accuracy in Voltage Surveys

[*Continued from page 48*]

bration might be upset for several hours by leaving it at room temperature for any extended period. It is suggested that, if specially designed instruments are not available, complete performance curves similar to those in Fig. 1a be taken on each voltmeter being used and that these curves be carefully studied before correction factors are applied.

Conclusion

The importance of the ambient-temperature influence of voltage-survey voltmeters has been discussed, and it has been shown that this influence can be minimized by special-purpose design. Working on this basis, a considerable number of instruments similar to that shown in Fig. 1 have been built and have found wide acceptance. While such instruments have a guaranteed temperature variation of 0.01 of 1 per cent per degree C. or less for the 150-volt, single-rated instrument and 0.015 of 1 per cent for the 300-volt range, double-rated instrument, they are available at no increase in cost. The use of such instruments should lead to a considerable improvement in the over-all accuracy of voltage surveys.

•

Invites Bill Inspection

"Our office is open at all times to any individual or firm desiring to check their bills against our recent rate reductions," J. F. Maddox, manager of the New Mexico Electric Service Company, Hobbs, N. M., announced recently. "The new rates are now effective. We want no misunderstanding. The bills just sent out reflect those reductions. Our patrons are invited and even urged to consult with us about their bills."

•

Grant Water Storage Plea

Application of the West Kootenay Power & Light Company to store water in Kootenay Lake by lifting its level six feet has been granted by an international joint commission which has held hearings in British Columbia and Idaho. The company wishes to store water in the lake to supplement the low water for power purposes. It also wants to widen and deepen the Kootenay River at Grohman Rapids, two miles west of Nelson, B. C.

Tap Line Built to Defy Heavy Glaze

[*Continued from page 49*]

Conductor selection was guided by experience with ice loads, especially on sloping spans. It had been observed that ice loads formed most easily on, and unloaded least easily from, stranded conductors, the spaces between strands apparently acting as anchor points for ice accumulation. Also, on sloping spans, if a sizable ice accumulation at the upper end started sliding, the effect was comparable to that of lands and grooves of a rifle on a projectile moving along the bore. As the conductor, unfortunately, could not rotate freely, it twisted off at the lower end and unstranded at the other. Therefore, a solid conductor was chosen. Adequate strength and conductivity were obtained by using No. 1/0 solid, high-strength Copperweld with 40 per cent conductivity.

Stringing sags

In computing stringing sags, tensions were held to 62.5 per cent of the rated ultimate strength under loaded conditions. This meant a stringing tension of only about 5 per cent of the rated ultimate at 50 deg. F., unloaded, which gave satisfactory sags under all conditions of loading.

Originally the plan was to use splices as the wire used was available only in short lengths, compared to copper. But because of a predicted storm, the approach of holiday season, delay in the delivery of special splices and the fact that numerous dead-end structures were incorported in the line, it was decided to complete the line without splices. This was accomplished by changing one tangent pole to dead-end construction, and by judicious location of the available wire lengths.

Power winch used

All digging and pole setting were done by hand, but about 80 per cent of the line could be reached by power winch for transportation of material. On one of the longest tangents materials were transported by aerial cable, the upper end being available to automotive equipment.

The rebuilt section was cut over and energized December 23, 1937, and has performed satisfactorily, turning in the first winter's record of trouble-free performance in this region of severe loading.

DENSE LONGLEAF PILING, POLES & LUMBER PRESSURE TREATED WITH CREOSOTE OR "WOLMAN SALTS"

—you're getting "DIXIE" dense longleaf yellow pine Poles—unsurpassed for uniform strength and durability. Furthermore, you'll find them in exact accordance with your specifications. If they are not for you, why not let us quote on your requirements?

"DIXIE" Poles, Piling and Construction lumber . . . . all dense longleaf yellow pine . . . are available untreated or pressure-treated with Creosote or "WOLMAN SALTS" preservative; also pre-fabricated to specification.

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STEEL STRAND ✣ TELEPHONE WIRE
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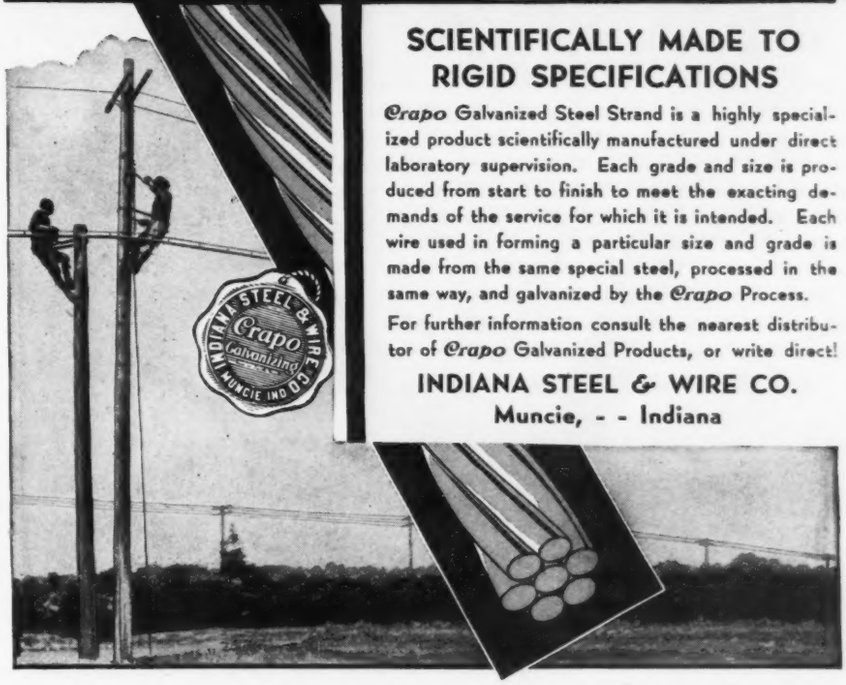
GALVANIZED PRODUCTS



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For further information consult the nearest distributor of *Crapo* Galvanized Products, or write direct!

INDIANA STEEL & WIRE CO.
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GREENLEE *Hydraulic* PIPE PUSHER

If you are using a pipe pusher that requires considerable man power, you can save time and money by putting a Greenlee Hydraulic Pusher in service. And if you are making installations by trenching, you can save still more.

With the Greenlee it is only necessary to make a trench large enough for the pusher and a section of pipe, and one man can send it where wanted, simply by pumping the handles. The speed is adjustable for varying soil conditions, and a push of from 4 to 7 feet, depending on the length of base used, can be made with but one setting of the pipe clamp.

Let us tell you all about this efficient tool and how it will save time and money.

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- BARE COPPER WIRE AND CABLE
- WEATHERPROOF WIRE AND CABLE
- MAGNET WIRE
- TROLLEY WIRE

WEATHERPROOF CABLE

"QUALITY ABOVE SPECIFICATIONS"

KENNECOTT WIRE AND CABLE COMPANY

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CINCINNATI, TRACTION BUILDING

Line Truck Body Weight Cut 35 Per Cent

[*Continued from page 59*]

a self-locking rest built on the front bulkhead of the loading space.

To raise the derrick into position for pole setting the winch line is hooked on to a hook at the foot of the pole and the forward end is unlocked, the winch started and the pole pulled into position and pinned in the two lugs at the center of the combination rear body bolster and kick plate. The butt of the pole rests on the rear body bolster and is pinned only to keep the pole from kicking out. It requires less than two minutes to get this derrick ready for pole setting.

Gin pole is a turned spar of selected yellow fir furnished by the Portland Spar Company. Iron work was by the body builder. Over-all cost of gin pole is less than $75.

Stiff legs

Stiff legs are made up of two standard, 3-ton Blackhawk hydraulic jacks, to which were added a larger foot plate and stem extensions with universal joints, attached to rear outside body bolster at each side. When not in use the stiff legs are hooked up out of the way behind the rear fender skirts, and when required are unhooked and extended to a ground bearing by releasing the pressure bypass screws on the jacks and pushing the feet to the ground. When coming to rest at the ground the pressure bypass screws are tightened and a few strokes of the jack handle take the load of the truck off the springs. Any load lifted by the gin or over the spindle shaft is transmitted to the ground through the rear bolster and stiff legs when they are set as described.

Line trucks, heretofore in the writer's experience, have always worked out so heavy in the empty or no-load condition that there has never been sufficient leeway to load the nominal rated pay load without overloading beyond this nominal from 50 to 100 per cent. The truck described in this article permits loading of a full 3 tons without exceeding the permissible gross load by so much as an ounce. The cost has proved very low compared with the cost of the old truck replaced. These trucks, while the body design is special, show over-all weights and costs below that of trucks equipped

The COMPLETE Line

Every kind of conductor fitting—for tube, bar, cable, or wire. Every size. More than 6,200 items.

Including many *Improved Fittings* originated by Penn-Union to give you quicker and easier connections, that are *Permanent* and *Dependable.*

Clamp Type Terminals for every size and type conductor. All types—for any application.

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Set-screw connectors for solid and stranded cable.

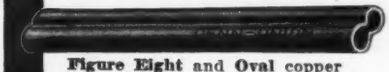

Figure Eight and **Oval** copper tube sleeves, also split tinned sleeves, etc.

Service Entrance Connectors, with heavy 1-piece hard drawn copper body.

Fuse Clips, Ferrule and Knife - Blade types, spring tempered bronze.

Every Penn-Union Connector is Dependable. Preferred by the leading utility companies and "industrials."

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with stock bodies with equal facilities and capacities.

The pole derrick, built for less than $75, requires no manual labor to raise and get ready for pole setting, and does not rob the truck of valuable loading space for long articles and other equipment. It is faster and less cumbersome than derricks built of steel tubing, which have to be assembled and dismounted and stowed each time they are used, even when only one pole is set. Setting up, dismantling and restowing a typical tubular tripod pole derrick requires the services of the whole truck crew, consuming from fifteen to thirty minutes for the work, according to the capacity and weight of the derrick. This is due to the weight of the various unit parts of a derrick of this type.

The light weight, reasonable cost and satisfactory operation of these trucks have fully justified the development cost.

•

Five Million Candle-Power Lights Cleveland Stadium

Installation of the finest system of floodlighting for night football games in the State of Ohio has turned a high school athletic field into the football center of Greater Cleveland. At Shaw Stadium, East Cleveland, Ohio, high school, college and professional teams will now play under 5,400,000 beam candle-power of light provided on the playing field by 80 Westinghouse 1,500-watt floodlights.

Under this new lighting there will be an average intensity on the playing field of 40 ft.-candles, according to illumination engineers of the Westinghouse Electric & Manufacturing Company, designers of the floodlighting system. The new floodlights are equally divided on each side of the playing field. The unit has a 20-in. diameter reflector of spun sheet aluminum finished by the "Alzak" process. The unit is dust-tight and weatherproof with high beam efficiency.

•

Locomotive Shipments Lower

Shipments of mining and industrial electric locomotives during the third quarter, as reported by 10 manufacturers comprising practically the entire industry, amounted to 60 locomotives valued at $314,732, as against 78 valued at $447,836 for the second quarter and 163 valued at $1,158,057 for the third quarter last year, according to the Department of Commerce.

KLEIN "Lightweight" CLIMBERS

Klein "Lightweight" Climbers are built to the minimum weight possible consistent with maximum safety. Every pair is tested exactly the same as are the old time tried Standard Climbers. The lineman can throw his weight on these climbers with confidence —they are Klein's!

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

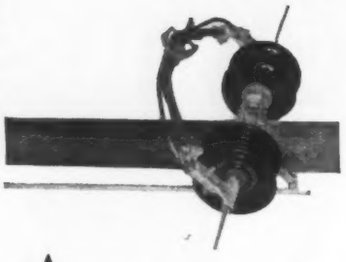
The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ **Lightweight Climbers.**
- ☐ **Specifications on Linemen's Belts and Safety Straps.**
- ☐ **Klein Kord Fabric Safety Straps.**
- ☐ **Pocket Tool Guide.**

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.

K-P-F

Pole Top High Tension Switches



A K-P-F switch merely consists of two deadends with a rigid jumper containing a contact so arranged that it can be opened and closed. This constitutes the NECESSARY and SUFFICIENT parts of a disconnecting switch.

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Lamp Replacers
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STRONG · CORROSION FREE · DURABLE

ONE OF THE MANY BURNDY CONNECTORS

SERVITS

Plate Rectifiers Take On Four-Figure Amperes

[*Continued from page 56*]

studio to strip and reclaim silver from film.

Vehicle, railway and other types of battery charging, welding are similar applications requiring relatively large currents at relatively low voltages.

As the output voltage (Fig. 2b) increases, up to the maximum rating, efficiency also increases. Of particular importance is the high efficiency maintained over a wide range of load, practically from one-quarter to full load. Since the average installation is frequently operated at less than full load, this characteristic is quite significant.

Voltage regulation (Fig. 2c) also improves with increase in output voltage, which is natural since the forward voltage drop within the plate is found to be the same no matter what the output voltage is.

•

Limits Oil for Power Plants

A Royal decree-law published in the Italian Official Gazette provides that all new power plants, either for public or private use, must be provided with a device for the use of solid fuel, gas, or electric power, according to a report from the office of the American commercial attache at Rome. Such plants may no longer be constructed for the exclusive use of liquid fuel. Exception is made for plants and apparatus of merchant vessels and in cases where it is held by the controlling authorities that the use of plants or apparatus with liquid fuel consumption is technically indispensable, according to the Commerce Department.

•

Minnesota Highway Lighting

The Minnesota highway department has approved the installation of about 100 General Electric luminaires, employing sodium and incandescent lamps, along more than two and a half miles of U. S. highways 16 and 218 at Austin.

•

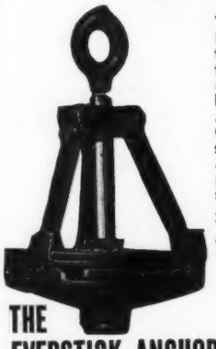
REA Got One RFC Loan

Of the new loans authorized by the Reconstruction Finance Corporation since lending was resumed at the end of February this year, the Rural Electrification Administration received one loan, totaling $30,000,000, Jesse Jones RFC chairman, has announced.

THE SAFE ANCHOR FOR R.E.A. CONSTRUCTION

For long life and economy in annual maintenance costs, Everstick Anchors are first choice in rural electrification construction. Their safety and dependability have been proven on millions of miles of electric lines.

ANCHORS FOR EVERY PURPOSE



The complete line of Everstick Anchors offers three expanding types in a complete range of sizes and holding capacities. Also rigid type Cone Anchors in all sizes. Made of malleable iron with its properties of strength, elasticity and rust resistance. Write for new bulletin "Everstick For Rural Electrification."

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Cutting Over to Network Distribution

[*Continued from page 54*]

to 0.2 second, and the current setting dropped from 480 to 400 amp. Purpose of this was to de-energize the feeder as quickly as possible, thus eliminating positive torque on the relay disk so the protector could be tripped before the back-up fuses blew.

Single-phase induction regulators, rated 400 amp., 2,400 volt, are employed on each feeder. Present operation is non-interconnected, at 10 per cent resistance compensation, no reactance. That this scheme is satisfactory is evidenced by the fact that potential in the most remote sections does not vary more than 4 volts in 24 hours and is maintained at 118 volts under load.

Costs estimated from the time when installation of equipment was 90 per cent completed are as given in the following table:

Commerce Street—	
Duct and vault system	$60,058.07
Electrical equipment	180,939.19
New underground—	
Ducts and vaults	171,948.62
Electrical equipment	180,000.00
	$593,045.88
15-duct line, per foot	$7.25
12-duct line, per foot	6.50-7.00
9-duct line, per foot	5.00
Vaults, each	1,000-1,400
Service handhole, large	200
Service handhole, small	75
Manhole, large	625
Manhole, small	280
Total cost per kw.	$45.61

What Tacoma has made is an investment in modernity and reliability, with an eye to both the present and the future. The record of this procedure is presented in the event that it may serve, not necessarily as a model, but as a guide to those who may undertake a similar program elsewhere.

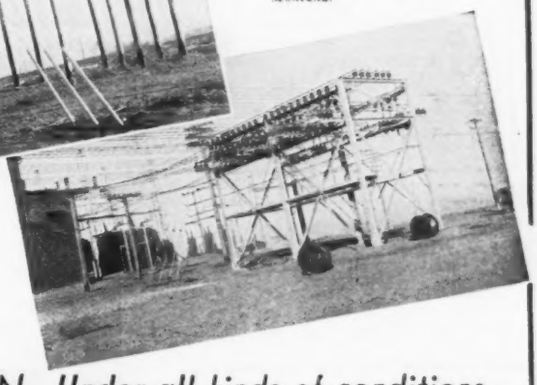
•

Los Angeles Light Gains

Net earnings of $5,928,975 are reported by the Municipal Bureau of Power and Light, Los Angeles, for the fiscal year ended June 30. The profit represented an increase of $856,114 over that of the preceding year. The balance sheet puts the bureau's assets at $206,856,941. The report shows that the earned surplus of $54,740,269 on June 30, 1937, was increased to $60,115,645 this year after deduction of a $553,900 payment to the reserve fund for taxation. Electric rates were reduced $1,300,000 during the year.

• *Wood Pole Structure for 6600 v distribution system forming a turn of ninety degrees.*

• *Steel Switching Tower erected at Fort Peck, Montana.*



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BOOK REVIEWS

Principles of Electricity and Electromagnetism

By Gaylord P. Harnwell. Published by McGraw-Hill Book Company, 330 W. 42nd Street, New York. 605 pages, illustrated. Price $5.

Introduction to electrostatics quickly passes from the historical qualitative treatment to the Gauss theorem. Thereafter the author uses curls and grads consistently in vectorial explication of the phenomena of electrostatics and electromagnetism. Quite naturally differential equations abound to such extent as to make a prior course in the calculus and in general college physics a dual prerequisite. Dielectics are approached from the polarization sector.

Despite the mathematical thoroughness the author has managed to bring in (and not incongruously) such typical developments of recent years as the Van de Graaf generator, electrolytic condensers, arrester functioning of thyrite, photo-electric emission and perminvar. D.c. generators, alternators, iron-core transformers, couplers are all subjected to the same generalized analysis based on vectorials and differentials. Much, of course, is devoted to communication circuits, apparatus and basic phenomena.

•

Theorie der Wechselstrommaschinen

(*Theory of Alternating-Current Machines*)

By Waldemar Michael. Published by B. G. Teubner, Leipzig. 272 pages, 210 illustrations. Price, 18 reichsmarks.

The mathematical theory of complex quantities is first reviewed. Its application is then developed with reference to various kinds of alternating-current apparatus, beginning with the transformer and including synchronous machines, polyphase and single-phase asynchronous, and various types of commutator machines, used singly or in concatenation. This leads into a detailed discussion of electromotive forces induced by transformer action and by rotation, conditions for sparkless commutation and related matters, theory of converters, frequency changes, and auxiliary machines. The author calls attention to the distinction between time vectors and space vectors and keeps the underlying physical concepts before the reader's mind.

•

Trane Air Conditioning Manual

Published by the Trane Company, La Crosse, Wis. 333 pages, illustrated. Price, $5.

Starting with the simple physics of heat, this practical textbook closes with more than 60 pages of tabulated reference data on such thermal phenomena as those of building losses, human heat, geographic and solar distributions, refrigerating cycles and liquids. Between these extremities the seven comprehensive chapters develop, first, the problem of comfort and the manner in which its assurance is complicated by heat gains and losses. The first of several large-size working charts is introduced in the chapter on the psychrometric properties of air. Here (as elsewhere) many numerical problems are worked out to show the value of the chart

Recent Catastrophes

**Along the Atlantic Seaboard,
Floods in the Ohio and Mississippi Valleys,
Windstorms and Sleet
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What protection have you when your power is interrupted?

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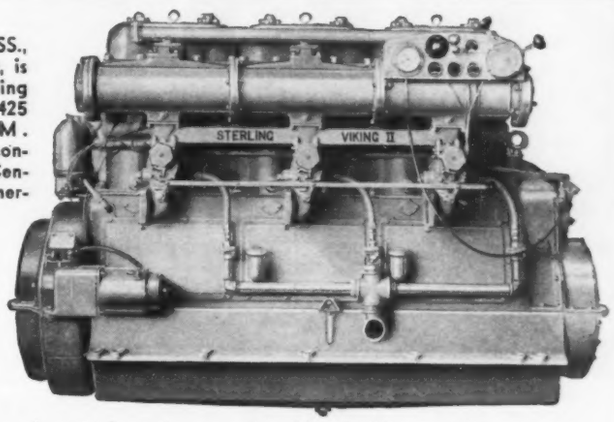

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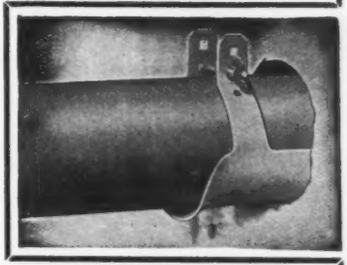

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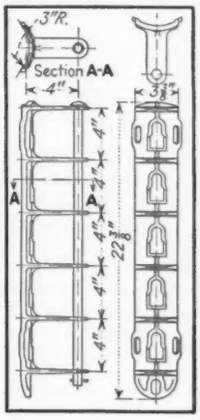

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This Universal Type Secondary Rack for standard 8-in. spacing with standard 3-in. wet-process insulators tests to ultimate tensile strength exceeding 15,000 lbs. in direct pull on through-bolts. Has safe working load up to crushing strength of insulators. Vertical load without distortion over 2,000 lbs. Side load capacity over 7,000 lbs.

Note bolt holes slotted in main one-piece malleable casting so that assembled Rack may be placed in position over heads of through-bolts projecting from pole. Hence, upper extension is unnecessary. Initial trial order accepted priced at $1.00 each less insulators, F.O.B. Branford, in bundles of 5 units—or sample sent without obligation to interested Supt. or Engineer.

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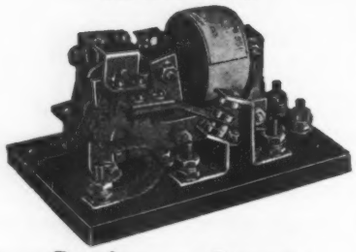

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in solving typical problems encountered in air-conditioning practice.

How to compute the supply of conditioned air is next shown in equally intricate detail. Equipment features and characteristics for the requisite refrigeration cycles are presented in lucid diagrammatic manner, with more charts to cover the quantitative relations and analysis of common operating troubles. Water requirements and the design of the systems to provide them are developed in still another chapter, which incidentally presents additional full-page working charts.

All chapters append problems for which the numerical answers are compiled in the back of the book. Padded charts and an air-conditioning ruler for use with the charts are available as supplements to the book. William Goodman is credited by the sponsor as the principal author.

•

Wood Preservation

By George M. Hunt and George A. Garratt. Published by McGraw-Hill Book Company, 330 West 42d Street, New York. 457 pages, illustrated. Price $5.

A government Forest Products laboratory official and a forestry school professor collaborate in this compilation of practices designed to defend wood against the inroads of fungi, insects, fire and mere weathering. The mechanism by which these destructions take place are quite well defined, but in language wholly intelligible to the user of timber. In order, there follows a discussion of the laboratory procedures by which the effectiveness of preservatives can be estimated comparatively, as well as detailed enumeration of the constituents of the preservatives in recognized use.

The authors are out of sympathy with proprietary mixtures for which the ingredient formulas are withheld by the promoters—they fear too much likelihood of inconstancy of cheap concoctions sold at fancy prices based on fancy claims. The composition of Osmose is given. The preservative processes are described following a recital of the procedures under which the timber is prepared. Specifications and test results are fairly comprehensive at this point. Quite instructive to pole users is the chapter analyzing the factors which determine penetration and absorption. Little data are given on poles in the chapter on the economic aspects of preservative treatment, much less than for ties. Closing chapters deal with the resultant properties of treated wood, with the equipment of typical treating plants and with fire-retarding treatments.

•

Tables of Functions

By Dr. Eugen Jahnke & Fritz Emde. Published by B. G. Teubner, Leipzig. 305 pages. Price, 15 reichsmarks.

Many improvements have been incorporated into the former (1933) edition in connection with some of the lesser functions, such as the elliptic, Debye, Struve and hypergeometric functions. Others treated in both editions are the factorial, error-integral, Legendre, Cornu, Bessel, Neumann, Riemer-zero and Mathiew, with emphasis (as to space) being placed on the elliptic and Bessel functions.

Each function is evolved into a range of values and then a plot is presented to show the warped surface which results when the three-dimensional figures are constructed to represent the functions. The sine-integrals appear first, then the factorial functions and the inverted forms.

SEARCHLIGHT SECTION

(Continued on pages 121, 122 and 123)

OFFICIAL PROPOSAL

Bids: November 29 (45)

Substation Equipment

DISTRIBUTION SUBSTATION EQUIPMENT,
P.W.A. PROJECT DOCKET NO. TENN. 1105-P-DS,
ELECTRIC DISTRIBUTION SYSTEM,
SUB-PROJECT—CONTRACT NO. 3-L
ELECTRIC POWER BOARD OF CHATTANOOGA,
CHATTANOOGA, TENNESSEE

Sealed proposals for the manufacture and delivery of Sub-Project—Contract No. 3-L of the Electric Power Board of Chattanooga, acting for and on behalf of the City of Chattanooga, Chattanooga, Tennessee, P.W.A. Project Docket No. Tenn. 1105-P-DS Electric Distribution System SUB-PROJECT—CONTRACT NO. 3-L will be received by the Electric Power Board of Chattanooga, Chattanooga, Tennessee, at the office of the Secretary of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee, until 1:30 P.M. on the twenty-ninth day of November, and will be immediately publicly opened and read by the Electric Power Board of Chattanooga.

Copies of the Proposal, Contract Documents and Specifications may be obtained from the office of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee. A deposit (certified check) of twenty-five ($25) dollars will be required for procuring the Proposal, Contract Documents and Specifications. The deposit for these documents will be returned to all except the successful bidder upon the return of the documents in good condition within ten (10) days after the bids are opened.

A copy of the Proposal, Contract Documents and Specifications may be examined free of charge at the Chamber of Commerce and the office of the Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Each bid must be accompanied by a Certified Check, or Bidder's Bond executed by the bidder and a surety company licensed to do business in Tennessee, in the sum of ten (10%) per cent of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a Performance Bond in the amount of one hundred (100%) per cent of the contract price. This Performance Bond shall be made through a Company having a duly authorized representative in Chattanooga, Tennessee, upon whom process may be served.

All items in the proposal form and on data sheets must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

Bidder's name must be placed on the envelope containing this document and also upon this envelope shall be designated the name and contract number which the bid covers.

WITHDRAWAL OF BIDS: Bidders may withdraw bids at any time prior to the opening, but thereafter no bidder may withdraw a bid submitted for a period of sixty days after the date set for the opening of such bids.

The estimated cost of the equipment of the Project covered by this contract is $85,000.

The Electric Power Board of Chattanooga, Chattanooga, Tennessee, reserves the right to reject any and all bids, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

ELECTRIC POWER BOARD OF CHATTANOOGA,
Chattanooga, Tennessee,
By L. J. WILHOITE, Chairman,
J. C. TWINAM,
G. H. PATTEN,
STANTON E. SMITH.

Will F. Chamlee, Counsel.
Attest:
N. J. Simmons, Secretay.